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Perceived Consequences of Risky Behaviors: Adults and Adolescents

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Adult and adolescent Ss were asked to list possible consequences of either accepting or declining opportunities to engage in various potentially risky behaviors (e.g., drinking and driving, skipping school to go to a mall). Response patterns were quite similar for these adults and adolescents, indicating shared beliefs about the possibilities. Although taking and avoiding a risk are logically complementary actions, they did not prove to be psychologically complementary. Other comparisons showed systematic differences in the consequences produced for one-time and regular (or repeated) versions of the same behaviors, as well as for open-ended and closed-ended response modes. These results are discussed in terms of their methodological implications for studying risk perceptions, their practical implications for influencing adolescents' risk behaviors, and their theoretical implications for understanding intellectual development.

In recent years, there has been much concern about adolescents' "risk taking" behavior, such as reckless driving, sex without contraceptives, drug use, and drinking (Dryfoos, 1990; Feldman & Elliott, 1990; Gardner, Millstein, & Wilcox, 1991; Hayes, 1987; Office of Technology Assessment, 1991). At times, that concern expresses itself primarily in sorrow over the difficulties that youths experience as a result of these behaviors. Often, it goes on to criticize youths for taking actions or making decisions that adults believe are not in the youths' best interest. This criticism may go even further, alleging that youths' decisions represent irrational behavior.

These situations (and charges) raise important practical, political, and theoretical issues. Practically speaking, designing programs for improving the health of adolescents requires a detailed understanding of where they go astray (e.g., Baron & Brown, 1991; Best, Thomson, Santi, Smith, & Brown, 1988; Botvin, 1983). Politically, adolescents' right to make their own decisions (e.g., regarding reproductive issues) depends on how adult society (and its legal institutions) views their competence (e.g., Baumrind, 1987; Gardner, Scherer, & Tester, 1989; Gilligan, 1982; Scherer, 1991; Weithorn & Campbell, 1982). Theoretically, the higher order cognitive skills involved in decision making are indicators of general processes of intellectual development (e.g., Keating, 1990; Nelson, 1992).

The present study applies the perspective of decision theory (Edwards, 1954; Yates, 1990) to understanding one potential determinant of adolescents' risk behavior: their ability to anticipate the possible outcomes of such behaviors. The next section provides a general background to decision theory, and the following section critically reviews studies of adolescent decision making. The study itself addresses a set of substantive and methodological issues raised by those studies. Fuller treatments of the relationship between decision theory and adolescent development can be found in Baron and Brown (1991), Beyth-Marom, Fischhoff, Quadrel, and Furby (1991), Fischhoff (1992b), Furby and Beyth-Marom (1992), and the references therein.

A Decision Theory Perspective

A *risk behavior* can be defined as an action entailing some chance of a loss. To the extent that they represent conscious actions, risk behaviors reflect choices among alternative courses of action. From a decision theory perspective, choosing a risky (or nonrisky) action is rational if the choice reflects the relevant values and beliefs of the decision maker. When two individuals have different values and beliefs, they can rationally choose different actions under the same conditions. To compare the behavior of two individuals and to evaluate the rationality of each, one needs to examine the components of their respective decision-making processes (Raiffa, 1968; von Winterfeldt & Edwards, 1986; Yates, 1990, 1992).

Decision theory specifies five general steps to be taken in making any decision: (a) identify the possible options; (b) identify the consequences that might follow from each option; (c) evaluate the desirability of each consequence; (d) assess the likelihood of each consequence, should each action be taken; and (e) combine these steps according to a logically defensible decision rule. Normative decision theory studies how these steps

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should be followed in specific circumstances. Behavioral decision theory describes actual behavior, using these normative analyses as an evaluative template, often with the ultimate aim of helping people to make better decisions. This general scheme underlies a variety of theoretical approaches, focused on decision making in specific domains (Weinstein, 1987a; Yates, 1992). They include expectancy-value models of achievement behavior (Feather, 1982), health belief models (Janz & Becker, 1984; Rosenstock, 1974), Ajzen and Fishbein's (1980) theory of reasoned action, and Janis and Mann's (1977) balance-sheet method.

Extensive literatures have evolved studying how people perform each of these steps (Fischhoff, 1988; Fischhoff, Svenson, & Slovic, 1987; Kahneman, Slovic, & Tversky, 1982; Slovic, Lichtenstein, & Fischhoff, 1988; von Winterfeldt & Edwards, 1986; Yates, 1990, 1992). They have revealed a complex patchwork of strengths and weaknesses. The latter represent cognitive skills that have not been reliably mastered by adults (sometimes even when performing in their areas of expertise).

This possibility creates several related roles for comparisons between adults and adolescents performing the same tasks (Shaklee, 1980). One such role is estimating the asymptotic level of performance that can be expected from adolescents (assuming that their learning experiences parallel those of the comparison adults). A second role is providing a more realistic standard for evaluating adolescent performance than the normative solution to a decision-making task (which is sometimes taken as representing adult performance). A third role is helping to clarify when and why these developmental processes are arrested.

The present study looks at several aspects of the developmental processes involving one particular decision-making skill: identifying the possible consequences of a decision (Step *b*). The following section sets the stage by describing how this step has been treated in some of the most extensive studies of adolescent risk decisions.

Studies of Adolescent Risk Decisions

A decision-making perspective was adopted in a number of studies that attempted to predict adolescents' risk-taking behavior from different components of their decision-making processes, most notably their beliefs regarding the consequences of possible actions (Leigh, 1989). Some of these studies (e.g., Benthin, 1988; Morrison, 1985; Namerow, Lawton, & Philiber, 1987; Phelps, 1987) looked at how adolescents assess the likelihood that consequences will be realized. Others (e.g., Kegeles, Adler, & Irwin, 1988; Klayman, 1985) looked at how adolescents view the utility (or disutility) of those consequences and the trade-offs required when one cannot have everything. None, however, seem to have looked at the production of consequences per se.

In one prominent study, Bauman (1980) asked teens how likely each of 54 possible consequences would be if they used marijuana, as well as how attractive (or unattractive) each would be if it did occur. Bauman found that the most important (high valence and high probability) positive consequences of marijuana use were ones bringing direct and immediate physical or psychological satisfaction. Consequences having low salience and probability were ones like "being more liked by friends" or "feeling closer to others." Bauman devised a formula for combining subjects' probability and attractiveness judgments into a subjective expected utility index. It had modest success in predicting subjects' self-reported use of marijuana, explaining about 20% of the variance.

Urberg and Robbins (1981) performed a similar (although less comprehensive) study regarding the possible consequences of smoking. They found some relationship between the numbers of costs and benefits that subjects indicated and their reported intentions to smoke (see also Bauman & Chenowith, 1984). The same method has been used to study drinking behavior by Barnes (1981), Bauman and Bryan (1980), and Bauman, Fisher, and Koch (1988). Bauman and Udry (1981) and Gilbert, Bauman, and Udry (1986) have used it to study teenage sexual intercourse. In general, these investigators have had moderate success in predicting behavior. Their studies have, however, some common features that may have limited that success.

By and large, these possible limitations are shared by other methodologies (cited earlier) that attempt to estimate people's perceptions of the components of a decision-making model whose structure has been set by the investigator. The more open-ended methods used in this study could be seen as precursors to more structured and standardized methods or as complementary methods, providing a more focused look at one component of the process.

Open Issues

One possible limitation of these studies is that they have almost invariably asked respondents to judge the consequences of only one alternative: performing the focal risky act. From a decision theory perspective, however, those evaluations are indeterminate, because they ignore the attractiveness of alternative actions. Individuals who evaluate an action quite similarly might see its alternatives quite differently. For example, adolescents might share their parents' view of the risks and benefits of smoking or experimenting with drugs, yet act differently because they disagree about the consequences of abstinence.

When there are only two options, each consequence of one option could, in principle, be expressed in complementary form as a consequence of the other. For example, smoking brings a risk and a pleasure; not smoking brings the benefits of avoiding that risk and the opportunity costs of forgoing the pleasure. However, formal complementarity need not mean psychological equivalence. That is, experiencing a consequence as the result of an action may be valued differently than not experiencing it as the result of the complementary action. For example, people might feel different degrees of responsibility for a consequence depending on whether it occurs as a result of something that they have done or have not done (Ritov & Baron, 1992). They may judge its likelihood differently, depending on what the initiating action is. Moreover, different consequences may come to mind with different focal actions. Overlooked consequences are, in effect, treated as impossible or immaterial. Some investigators (e.g., Ajzen & Fishbein, 1980; Beach, Townes, Campbell, & Keating, 1976) have argued that the consequences of doing and avoiding a behavior are effectively equivalent as predictors of behavior. To the extent that this assump-

tion is erroneous, making it would restrict one's predictive ability.

A second possible problem is that many studies ask subjects to judge the consequences on a fixed list. Such predetermined lists might suggest consequences that subjects have never thought of and omit consequences they would naturally consider. Even when the lists are compiled from consequences generated by earlier open-ended interviews, subjects who receive the lists need not have spontaneously produced more than a small portion of the consequences that they rate as relevant. In a very different risk context, Furby, Fischhoff, and Morgan (1990) found that women and experts produced somewhat different lists of possible consequences of actions taken to reduce the risk of sexual assault (Fischhoff, 1992a).

A third possible problem is that investigators have not always been that clear about the time perspective involved. That is, are subjects being asked about general "policy" decisions or specific "tactical" ones? Although an individual's behavior can always be described as a long-term pattern, that pattern may be understood better as the cumulative result of specific, tactical decisions. Thus, adolescents who drink and drive or use drugs regularly might never have decided on that as a policy but have nonetheless succumbed on repeated occasions, each of which they tried to judge on its own merits (Cvetkovich, Earle, Schinke, Gilchrist, & Trimble, 1987). Marlatt (1979) suggested that relapses in alcoholism may not be the result of a single decision to drink but the culmination of a series of little decisions, each apparently irrelevant to drinking but culminating in the resumption of alcohol use. Adolescents may judge the consequences of a risky behavior quite differently when they think of it in a long-term or short-term perspective. Unfortunately, some studies have predicted one-time behavior on the basis of what seem to be perceptions about repeated behavior. For example, Bauman (1980) predicted whether adolescents who had never smoked marijuana would do so at least once on the basis of their answers to questions about consequences of smoking, many of which make sense only in the context of regular behavior (e.g., go on to harder drugs, die from an overdose, control weight, and not live as long).

Finally, these studies have examined only adolescents, thereby offering limited insight on developmental processes. They may also create the impression that adults would know and provide the correct answers, thereby avoiding imprudent risk behaviors. A less extreme hypothesis is that adults just know more than adolescents (although not necessarily everything). It would be supported by several observations: that adults have had more opportunity to see the consequences of risky behaviors, that adults are often hypersensitive to the risks that their own teens face, that adolescents seem to be looking for fun more than for trouble, and that any concurrent cognitive development should help adults to project future possibilities, especially more abstract ones. Thus, one might predict that adults will produce more consequences, a higher proportion of negative consequences, and more indirect ones (consequences that would have occurred had the other option been taken). On the other hand, adolescents may know more about the details of their world (and the consequences that it metes out) than do adult observers. They may also have absorbed the theory of their world that is promulgated by adults (so that they know what they are supposed to say). If there are no differences in the consequences anticipated by adults and adolescents, then behavioral differences must be sought elsewhere (e.g., the probabilities attached to the consequences or the tendency to respond impulsively, without considering consequences).

Overview

The present study addresses each of these issues. Initially, matched groups of adolescents and adults produced possible consequences of either taking or declining each of three risk actions on one occasion. Their responses are analyzed in terms of number, type (e.g., social or physical), valence (good or bad), and directness (i.e., whether caused by the action taken or by avoiding the action not taken). Subsequently, subjects produced possible consequences of regularly engaging in one risky act. Finally, subjects circled potential consequences of regularly engaging in one risky act on a fixed list drawn from a previous study.

Thus, our focus is on developmental differences in generating possible consequences of a single action, the task studied here that seems closest to actual decision making. The study, then, creates a context for those results with more restricted looks at the main effects and developmental interactions associated with two other issues. One of these is substantive, the difference between perceptions of one-time and regular behaviors; the other is more methodological, the difference between open and closed response formats.

Method

Stimuli

Six risky behaviors were chosen, each described as a possible one-time choice in a specific situation that teens might encounter. In the wording given to the teens, these were as follows:

Drink and drive: Your friends asked you to come along with them for a drive after a party where everyone had been drinking. You decided [not] to join them.

Smoking marijuana: You were at a party where marijuana was passed around. You decided [not] to smoke.

Skipping school: Some of your friends planned to skip school and go to the mall instead. You decided [not] to join them.

Taking father's car: Your friends asked you to take them for a ride in your father's car while your parents were away, even though they knew you didn't have a license. You agreed [refused].

Having sex: You discussed with your girl friend (or boy friend) whether to have sex together. Both of you decided [not] to do it.

Going to a beer party: Bill invited some of his friends to come to his house for a beer party while his parents were away. You decided [not] to go.

Parallel descriptions were given to the adults concerning decisions made by their child.

Marijuana and beer were used as regular behaviors in both the open and closed formats because Bauman (1980) and his colleagues (Bauman et al., 1988) have published fixed lists of consequences for these behaviors (formulated as "using marijuana" and "having one beer or drink of hard liquor each week"). These two topics were also used for the regular behavior questions. The other topics were intended to complete a diverse set of familiar risk situations.

Table 1
Study Design

Type of behavior	Questionnaire			
	1	2	3	4
One-time	Drink and drive, yes Smoke marijuana, no Skip school, yes	Drink and drive, no Smoke marijuana, yes Skip school, no	Take father's car, no Have sex, yes Go to a beer party, no	Take father's car, yes Have sex, no Go to a beer party, yes
Regular	Drink beer, open Smoke marijuana, closed		Smoke marijuana, open Drink beer, closed	

Questionnaires

Table 1 shows the design of the four questionnaires, each involving five decision situations. Subjects responded, in turn, to (a) three decisions about one-time behaviors, presented in an open-ended format; (b) one decision about a regular behavior, also open-ended; and (c) one decision about a regular behavior in a closed-ended format. In the first three questions, subjects were asked about the consequences of one response option, alternating (across successive questions) between taking and not taking the focal action. Each question that a subject faced dealt with a different behavior. Asking each subject about several behaviors creates the possibility of order effects. Two problems (drinking and driving, taking father's car) always appeared first in the questionnaire and thus were free of any influence from preceding questions. As will be seen, response patterns on these questions resembled those for questions that came later in the forms.

Questionnaires 1 and 2 presented the same one-time situations, but with different decisions (yes or no) regarding the focal behavior. On both questionnaires, the one-time situations were followed by an open-ended question concerning the regular use of beer and a closed-ended question concerning the regular use of marijuana. Questionnaires 3 and 4 were designed with a similar format, but involved three different one-time situations. On these questionnaires, the question about regular marijuana use was open-ended, whereas the question about regular beer use was closed-ended. In this design, different subjects answered the one-time and regular open-ended versions of each question. Thus, subjects who listed consequences for the one-time marijuana question (in Questionnaires 1 and 2) also listed consequences for the regular open-ended beer question and vice versa. Different subjects answered the open and closed versions of each question regarding regular behavior.

Adolescent subjects were told to assume that they had taken (or avoided) the indicated action and then to "list possible things that might happen as a result of your decision." Adult subjects were told to assume that their son or daughter had done so.

Instructions

The questionnaires began with general instructions (adult version in brackets):

> My colleagues and I are interested in how people make decisions, especially how teenagers make choices [especially how adults perceive teenagers' choices]. We'd like you to help us by giving us your opinions regarding five different decision situations that you [teenagers] might face. Some of them are related to "hot" topics, that is, with deciding whether to do things that some people think are wrong or even illegal. We are not here to approve or disapprove. We just want to know what you think about these choices. **Remember that your name is not linked to your answers.**
>
> In each of these five situations, we want you to imagine that you have [your son/daughter has] made a certain choice. Then we would like you to tell us about all the things that might happen as a result of that choice, both good things and bad things. You [your son/daughter] may not actually have faced a similar decision and you [he/she] may never have to. We just want you to imagine that you have [he/she has] and to tell us what would be on your mind.
>
> Please write down your answers. However, don't worry at all about spelling or grammar. We don't care about them. We are only interested in what you think. (These last three sentences were omitted from the adult version.) There are no right or wrong answers. Just write as clearly as you can.

On the second page, subjects received a detailed example. They were told to imagine that they had found a wallet with $100 on the street and had decided to keep it. Then they were asked, "What are all the possible things that might happen as a result of that decision?" We explained that "possible things that might happen" meant "everything that you think is more likely to happen now that you decided to keep the wallet than if you had chosen not to keep it." Previous studies told subjects to mention everything that "might happen," instructions that ignore whether a consequence is actually relevant to the choice in question. Our wording directed subjects to consequences for which the behavior is diagnostic, in the sense of being more probable given the behavior than given its alternative.

We provided them examples of "possible things that might happen" and noted that "some of the listed things are events that might happen to you [your daughter/son] or to others. Some are feelings that you [your daughter/son] or others might feel. Some are good or positive, whereas some are bad or negative. We are interested in all these things—positive as well as negative." We stressed the fact that the things respondents mentioned might be highly probable or improbable, as well as the subjective nature of their lists. We used the term *things that might happen* after discovering in pretests that *consequences* elicited predominantly negative events.

Each of the four open-ended questions appeared on a separate page with 13 lines for writing the answers. For the regular behavior, open-ended question regarding beer, subjects were instructed to list "the good and bad things that you think are more likely to happen if somebody your [your daughter's/son's] age drinks beer regularly than if that person does not drink beer regularly." The marijuana question was analogous. The final, closed-ended question asked respondents to circle the relevant consequences from a list of 53 or 57 possibilities (for regular marijuana smoking or beer drinking, respectively), drawn from Bauman (1980, Bauman et al., 1988). To have consistent syntax, we made some minor wording changes (e.g., changing "feel happier" and "be more relaxed" into "feel happy" and "be relaxed"). One marijuana consequence was dropped because it appeared twice, as positive and as negative.

Finally, subjects completed a personal information questionnaire, taken largely from a longitudinal study being completed by Jessor (1990).

Subjects

A total of 398 subjects—199 parents and 199 adolescents—participated in the study. Of these, 158 were parent–teen pairs, receiving the same questionnaires. In the other cases, there were unmatched teens and adults. Subjects were recruited through organizations such as girl scout and boy scout troops, school sports teams, and parent–teacher organizations. Parents and children were used to have similar socioeconomic status in the two groups. Participating organizations received $5 for each participant or $12.50 per parent–teen pair, in return for filling out a packet of questionnaires that began with the present tasks.

The neighborhoods from which the subjects were recruited could be characterized as middle to upper-middle class on the basis of a number of variables (e.g., parental education level, school performance). The teen sample was 94.4% White and 73.4% female; 75% of the adults were females. The mean teen age was 14.8 years, with 50% between 14 and 16 years of age, and all between 12 and 18 years. The mean adult age was 42.5 years. Of the teen sample, 17% were in Grades 6 or 7, 35% in Grades 8 or 9, and 40% in Grades 10 and 11. About 50% of the teens reported very good school performance (i.e., having mostly As).

Most teens (86%) lived with both parents and an additional 11% with only their mothers. Most of the teens' parents had graduated from high school (96.8% of the mothers and 92.7% of the fathers). Some 41.6% of the mothers and 50.8% of the fathers had graduated from college.

In response to questions about risk behaviors, 58% of the teens reported never having smoked a cigarette, whereas 88% reported not having smoked in the last 6 months. Fifty-five percent reported not drinking at all during the last 6 months, whereas 13% reported drinking more than once a month. Ninety-two percent reported not having tried marijuana, and 88% reported never having experienced sexual intercourse.

Results

Coding

Each consequence was coded on three dimensions: its type (e.g., psychological effects and effects on peers), valence (good or bad), and directness (direct or negated).[1]

Type of consequence. An initial review of the responses indicated that most fell into one of four general types: (a) specified *personal effects* on the teen resulting from the behavior; (b) unspecified effects on the teen resulting from others' reactions (*social reactions*); (c) specified *effects on others* resulting from the actor's behavior; and (d) specified *behaviors* that the teen might engage in as a result of the decision. Consequences that did not fit readily into any of these categories were coded as *miscellaneous.* Overall, 0.9% of responses were classified in this way. The four high-level categories were divided into 19 more specific mid-level categories. For example, *social reactions* were divided into reactions from peers, family, other authorities (e.g., police), and others. The mid-level categories were divided further into 53 fairly specific types of consequence, forming the bottom level of the consequences hierarchy. Responses were assigned to these specific categories, then grouped at the higher levels. For the personal effects category, we found the need for a compound subcategory containing consequences with multiple possible effects. Typically, it involved the psychological and physical effects associated with consequences such as accidents, getting drunk, getting high, alcoholism, drug addiction, and pregnancy.

Valence of consequences. We coded the valence of all consequences from what we believed to be the adolescent's point of view, using *unclear* where needed. For example, *pregnancy* was treated as unclear unless accompanied by additional contextual cues, as was having sex (e.g., as a consequence of going to a beer party). Overall, 11.6% of adult responses and 7.1% of adolescent responses were categorized as unclear. The most common unclear causes were compound consequences (with a mixture of positive and negative effects), risk-amplifying ones (e.g., do it again, have sex [at a party]), and behavior toward others (e.g., "I would tell her about it").

Directness of consequences. This dimension was intended to explore the psychological complementarity of the alternative actions. A *direct* consequence is one that results directly from the chosen action or from an intervening behavior (e.g., "I'll get arrested" for driving after drinking). A *negated* consequence is one stated in terms of what might have happened if the opposite decision had been made (e.g., "I won't get arrested"—as a result of deciding not to drive after drinking). In some cases, subjects' choice between a direct consequence and the parallel negated one might be just a semantic preference ("my friend will hate me" vs. "my friend won't like me"—for refusing an offer to smoke at a party). In others, it might reflect different thought processes, focused on the action chosen ("they will hate me since I refused") or on the one foregone ("if I had accepted the offer, they would have liked me").

Two individuals independently coded an initial group of responses and then discussed and resolved any discrepancies in coding. After they had developed the coding guide, reliability was evaluated by having each coder apply it to 416 consequences. Agreement was 89% on the 53 bottom-level type categories, 97% on valence, and 99% on directness. The two coders then divided the remaining responses. After all coding had been completed, both coders judged a common set of 285 responses. Percentage agreement was only slightly lower: approximately 85% for bottom-level type categories, 96% for valence, and 98% for directness.

The same individuals also coded the consequences on the lists used in the closed-ended marijuana and beer questions. For the 53 possible consequences of smoking marijuana, the coders agreed in 47 cases (88%) regarding bottom-level type, in 51 cases (96%) regarding valence, and in all cases for directness. Similar agreement was observed with the 57 beer consequences: 91%, 95%, and 100% for bottom-level type, valence, and directness, respectively.

One-Time Decisions

Number of consequences mentioned. Table 2 presents the mean number of consequences mentioned by each group (adults or teens), for each version (yes or no) of each of the six open-ended questions involving one-time behaviors. Separate two-way analyses of variance (ANOVAs) were performed for each question with group and version as factors.[2]

[1] The detailed coding procedures are available on request from Baruch Fischhoff.

[2] The first three rows in Table 2 present responses to Questionnaires 1 and 2. The larger sample size for these forms reflects design considerations from a concurrent study involving high-risk teens. For these

Table 2
Mean Number and Standard Deviations of Consequences Produced as a Function of Group, Question, and Version

	Yes						No					
	Adults			Teens			Adults			Teens		
Question	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*
Drink and drive	6.59	2.72	69	5.81	1.91	69	6.36	2.66	67	5.10	1.88	60
Smoke marijuana	6.44	3.36	69	5.34	2.19	67	5.13	2.09	67	4.60	1.38	62
Skip school	5.52	2.37	68	5.47	1.84	68	5.04	2.23	68	4.66	2.02	61
Take father's car	6.52	2.38	31	5.82	2.21	34	5.13	1.70	32	5.10	1.68	29
Have sex with friend	6.81	2.83	32	6.58	3.01	36	6.45	2.46	31	4.85	2.35	27
Go to beer party	6.19	2.30	31	6.53	3.05	30	4.88	2.18	32	5.18	1.79	33

For each question, subjects wrote down, on average, between 4 and 7 consequences. In most cases, the adults produced somewhat more consequences than did the teens, for both the yes and the no versions. For all six behaviors, the yes version evoked more consequences than the no version.

The main effect for group was significant in the drink-and-drive question, $F(1, 265) = 12.36$, $p < .00$, and the marijuana question, $F(1, 265) = 7.83$, $p < .01$, and was nearly significant in the sex question, $F(1, 126) = 3.17$, $p < .08$. In those questions, adults produced more consequences than did the teens. In the three remaining questions, there was no statistically reliable difference.

The main effect for version was significant for five out of the six questions and was nearly significant for the sixth: for drink and drive, $F(1, 265) = 2.64$, $p < .11$; for smoking marijuana, $F(1, 265) = 12.32$, $p < .00$; for skipping school, $F(1, 265) = 5.90$, $p < .02$; for taking father's car, $F(1, 126) = 7.59$, $p < .01$; for having sex, $F(1, 126) = 4.61$, $p < .03$; and for going to a beer party, $F(1, 126) = 10.07$, $p < .00$. There was no significant Group × Version interaction in any of the six questions.

Valence of consequences. Figure 1 presents the average number of good and bad consequences for each question, version, and group. A three-way ANOVA was performed for each question separately, with group and version as between-subjects factors and valence as a within-subject factor.[3] Consequences having an unclear valence were disregarded in this analysis.

The most striking result is the interaction between valence and version. For all six questions, subjects described many more bad than good consequences of doing the focal behavior, whereas good and bad consequences of not doing it were, in most cases, equally common: for drink and drive, $F(1, 265) = 136.63$, $p < .00$; for smoking marijuana, $F(1, 265) = 158.57$, $p < .00$; for skipping school, $F(1, 265) = 92.2$, $p < .00$; for taking father's car, $F(1, 126) = 120.59$, $p < .00$; for having sex, $F(1, 126) = 89.39$, $p < .00$; and for going to a beer party, $F(1, 126) = 75.9$, $p < .00$. As illustrated in Figure 1, this pattern was quite similar for adults and teens. There were no other interactions, except for the car and beer questions, in which there were statistically significant (but not particularly interesting) three-way interactions between group, version, and valence. The differences in the numbers of good and bad consequences in the yes version were sufficiently large that there was a significant ($p < .001$) main effect for valence, for all but the sex question.

Directness of consequences. Figure 2 presents the mean number of direct and negated consequences for each version and group. A separate three-way ANOVA was performed for each question, with group and version as between-subjects factors and directness as a within-subject factor (disregarding consequences coded as unclear on directness). Almost all consequences of yes decisions were direct ones, whereas roughly one quarter of the consequences of no decisions were negated ones (i.e., consequences avoided by not taking the focal action). As a result, there were significant ($p < .001$) Version × Directness interactions for each question.

There were too few negated consequences in the yes version to merit further statistical analysis. For the no version of each event, teens produced more negated consequences than did adults. For four events (drink and drive, smoking marijuana, having sex, and skipping school), these Group × Directness interactions were statistically significant ($p < .01$). Between 24% and 40% of teens' consequences and between 10% and 27% of adults' consequences were negated ones. Looking at valence within direct and negated consequences separately, we found that more than half of the direct consequences were bad ones (except for having sex, where more were good). By contrast, 90% or more of the negated consequences were good ones (except for skipping school, where only 77% were good), meaning that a bad outcome has been avoided as a result of saying no to the focal behavior.

Type of consequences. We computed the percentage of subjects mentioning each type of consequence at least once. This was done for each version and group, for the bottom and middle levels of the coding hierarchy. Given the great detail at the bottom level, we focus here on mid-level coding.

Mid-level categories mentioned by at least 25% of the sub-

teens, drawn from places like substance abuse treatment centers, the *car question ("taking father's car") on Questionnaires* 3 and 4 was not meaningful. Their responses will be reported elsewhere (Beyth-Marom, Austin, Fischhoff, Palmgren, & Quadrel, 1992).

[3] Although positive and negative consequences were produced at the same time, the production of one did not constrain the production of the other. We did not ask subjects to produce consequences of one valence and then consequences of the other, because we did not want to telegraph our theoretical interest (in valence).

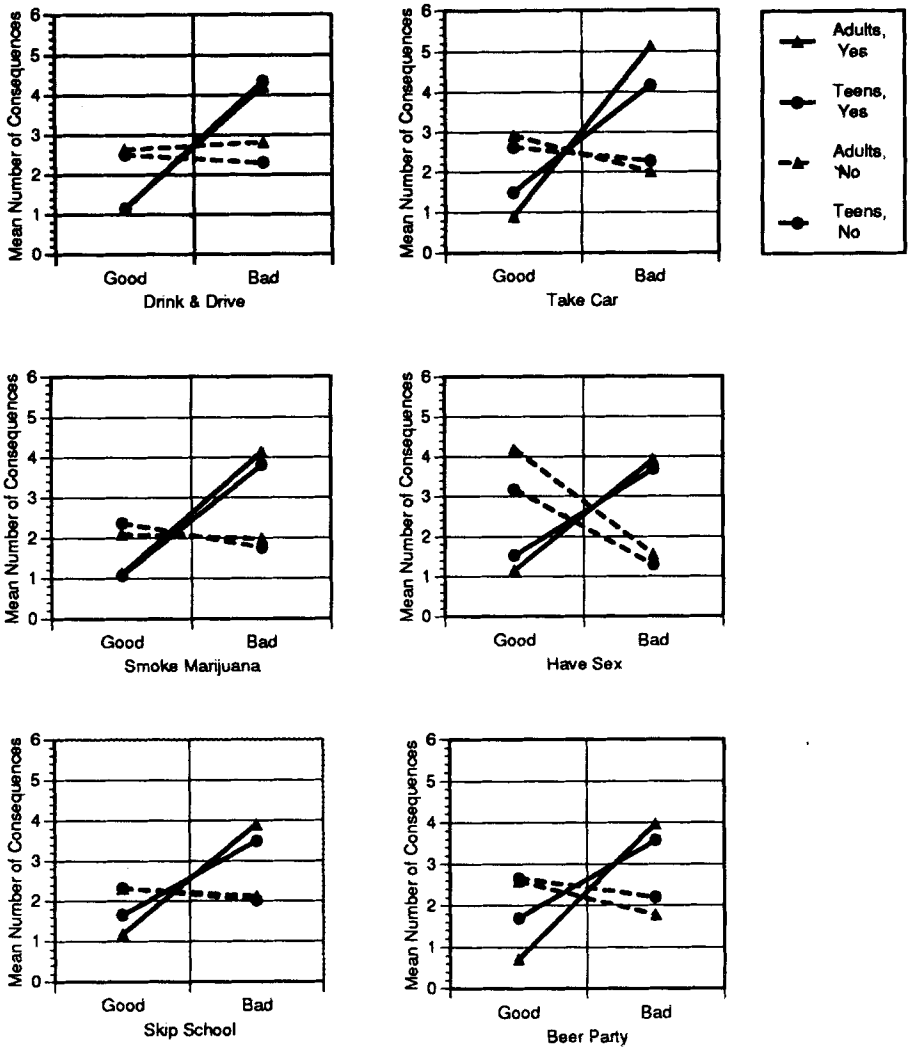

Figure 1. Mean number of consequences as a function of valence, question, and group for adults (triangles) and teens (circles) in the *yes* versions (solid lines) and *no* versions (broken lines).

jects are represented by open Os in Table 3, whereas the Øs designate categories cited by at least 50% of subjects. As can be seen, our coding scheme was such that the vast majority of responses were coded into labeled mid-level categories, with few falling into *other*. One clear pattern is that two of the four upper level categories—social reactions and personal effects—contained most of the mentions. This is true for each situation, version, and group.

A third pattern is that mid-level category mentions were situation dependent. For example, the possible (social) "reactions of an authority (other than the family)" was mentioned frequently, except with the sex question. "Effect on peers" (mainly the boy friend/girl friend in question) was mentioned most commonly there. Skipping school produced the fewest physical and compound consequences but more examples of possibly losing or gaining assets (e.g., miss class, get behind in school).

The Group column in Table 4 presents the results of a simple test for differences in teens' and adults' use of categories. For each of the 12 different questions (6 situations × 2 versions), we subtracted the percentage of teens who mentioned each mid-level category from the percentage of adults who mentioned it. We then performed binomial tests on the signs of these differences, treating the 12 questions as independent.[4] Where there was a significant difference, Table 4 lists that result along with the group using the category more frequently.

These tests suggest three main conclusions: (a) Teens are more likely than adults to have mentioned each social reactions category (peers, family, or other authorities) at least once. This is true despite teens' having produced fewer responses than adults overall. (b) Psychological, physical, and compound personal effects are mentioned with equal frequency in both groups. (c) Effects on others and behavioral responses were mentioned

[4] As shown in Table 1, each subject answered three of these questions about one-time behaviors, introducing some (indeterminate) degree of dependence in the responses.

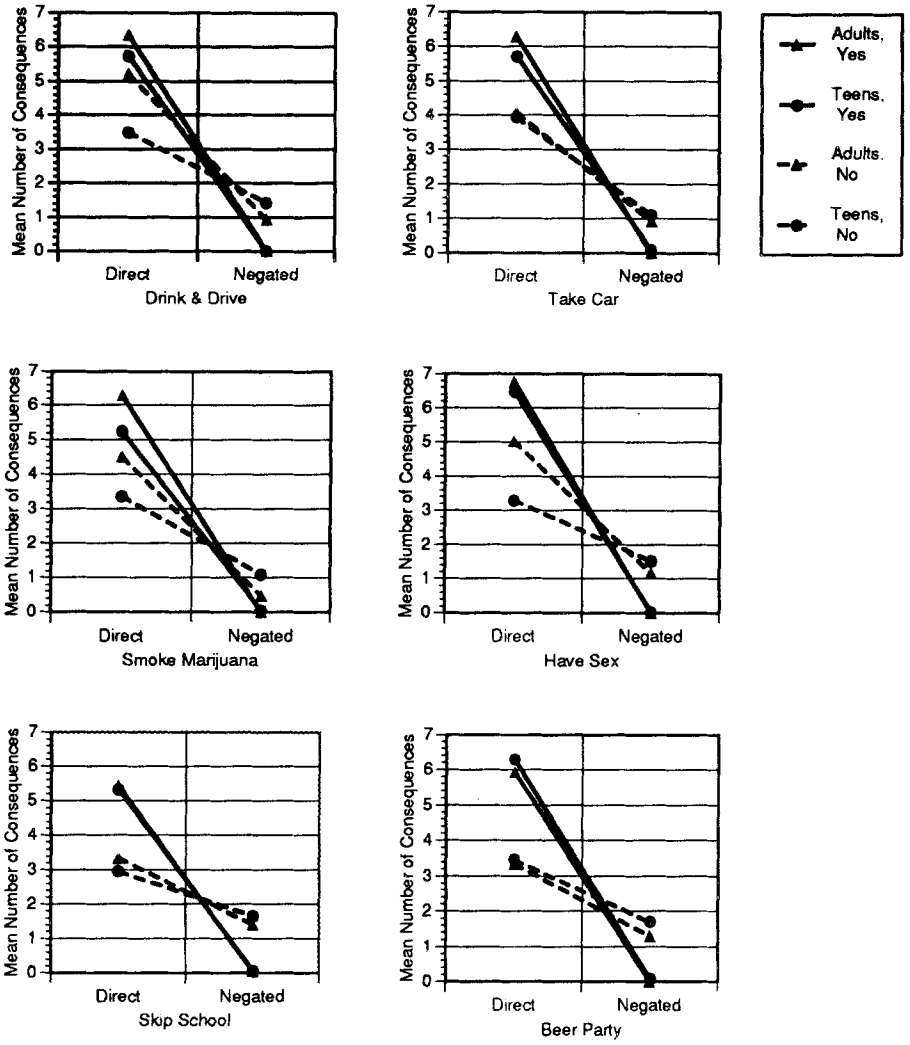

Figure 2. Mean number of consequences as a function of directness, question, and group for adults (triangles) and teens (circles) in the *yes* versions (solid lines) and *no* versions (broken lines).

more by adults than by teens, although (as seen in Table 3) even they did not mention these categories often.

The Version column in Table 4 uses an analogous procedure to compare the percentages of subjects who mentioned each category at least once under the yes and the no versions. They show that most categories were mentioned more frequently in the yes version of a question, consistent with the yes version having evoked more responses overall. The notable exception is social reactions of peers. It was mentioned by 25% to 50% (depending on the question) of subjects given a yes version, but by 80% to 100% when given a no decision. This is the most frequent consequence for no decisions; between two to eight other categories (depending on the question) were mentioned more frequently for yes decisions.

One-Time Versus Regular Decisions

The regular behavior questions paralleled the yes versions of the one-time decisions regarding beer and marijuana, except for asking what might happen if the behavior were performed regularly (without noting any specific context). We analyzed the data as before, except that directness is ignored because there were so few negated consequences for yes decisions.[5]

Number of consequences. As they did with one-time behaviors, subjects produced about six consequences for each regular behavior. A two-way ANOVA, with group (teen or adult) and frequency (one-time or regular) as variables, revealed no overall effect for either behavior. For beer, adults produced 6.19 and 6.95 consequences in the one-time and regular conditions, respectively; for teens, the means were 6.53 and 5.87. For mari-

[5] The two marijuana questions are similar in the decision made (smoke marijuana). The two beer questions are less similar: the one-time behavior was joining a beer party, whereas the regular behavior was to drink. Comparing the two questions assumes that most subjects interpreted joining a beer party as involving drinking.

Table 3
Frequently Mentioned Categories

Type of category	Yes												No											
	D&D		Mar		Skip		Car		Sex		Beer		D&D		Mar		Skip		Car		Sex		Beer	
	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T
Social reactions																								
Peers			O	Ø	O	O	O	Ø	O	Ø	O	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
Family	O	Ø	O	Ø	Ø	Ø	Ø	Ø	O	Ø	O	Ø	O	O	O		O	O	Ø	Ø			O	O
Other authority	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø			Ø	Ø	O	O	O		O	Ø	O	O			O	O
Other										O														
Personal effects																								
Physical	Ø	Ø	Ø	Ø			O		Ø	O	O	O	O	Ø		O					O	O		O
Psychological	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	O	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
Mental																								
Assets					Ø	Ø	O										Ø	O						
Compound	Ø	O	O	Ø			Ø	Ø	Ø	Ø	Ø	Ø				O					O	O		O
Other										O												O		
Effects on others																								
Peers	O						O		O	O											O	O		
Family																								
Other							O																	
Behavior																								
Additional risks	O		O								O													
Toward others	O														O						O			
Avoid risk																								
Other																								
Others																								
Relevant																								
Irrelevant																								

Note. D&D = drink and drive; Mar = smoke marijuana; Skip = skip school; Car = take father's car; Sex = have sex with a friend; Beer = go to a beer party; A = adults; T = teens; Ø = chosen at least once by 50% of the subjects or more; O = chosen at least once by at least 25% of subjects (but less than 50%).

juana, adults produced 6.44 and 6.51 consequences in the one-time and regular conditions, respectively; teens produced 5.34 and 6.51.

Valence of consequences. Table 5 presents the number of good and bad consequences for regular and one-time behaviors (omitting those that were unclear). For each event (beer and marijuana), we conducted a three-way ANOVA, with group (teen or adult) and frequency (one-time or regular) as between-subjects factors and valence (good or bad) as a within-subject factor. Each question yielded a strong Frequency × Valence interaction, with a higher proportion of good consequences for one-time behaviors: drinking beer, $F(1, 326) = 28.67$, $p < .00$; and smoking marijuana, $F(1, 262) = 36.45$, $p < .00$. On average, teens gave 29% and 19% good consequences for the one-time behaviors (for beer and marijuana, respectively), but just 13% and 13% for regular behaviors. Adults produced 10% and 19% good consequences for one-time behaviors, but just 8% and 5% for regular behaviors. Thus, these risk behaviors have proportionately more negative consequences when viewed in a long-term perspective.

Type of consequences. Table 6 presents the percentage of subjects mentioning each mid-level category at least once. The number in boldface indicates the frequency of behavior (one-time or repeated) for which each consequence was more common. One fairly consistent difference is that social reactions were mentioned more commonly as consequences of the one-time behaviors. An exception to this pattern is that parents were as likely to mention peer reactions for both one-time and regular behaviors. On the other hand, personal effects on mental functioning and assets were mentioned often for regular behavior but seldom as consequences of one-time actions. For both frequencies, social reactions of others and personal effects were the most commonly cited consequences. For both, adults were roughly twice as likely as teens to note the possibility of taking additional risks, as a result of the focal decision. Thus, although the two time perspectives produced similar numbers of consequences, they produced different types of consequences and ones with different valences (with bad consequences being relatively less visible when considering one-time behaviors in specific situations).

Open- Versus Closed-Ended Questions

Number of consequences. Subjects circled many more consequences on the closed-ended format than they wrote down in the open-ended one. For adults, the means were 26.7 and 27.2 for beer and marijuana, respectively, in the closed format, compared with 7.0 and 6.4 in the open. For teens, the means were 30.0 and 31.0 for closed versus 5.9 and 6.5 for open. The mean ratio between the number of consequences that individual sub-

Table 4
Differences in Percentage of Subjects Mentioning Each Category at Least Once

Type of category	Group: Mentioned more frequently by	Group: *p*	Version: Mentioned more frequently in	Version: *p*
Social reactions				
Peers	Teens	.06	No	.00
Family	Teens	.06	Yes	.01
Other authority	Teens	.02	Yes	.00
Personal effects				
Physical	NSD	—	Yes	.00
Psychological	NSD	—	NSD	—
Mental	NSD	—	NSD	—
Assets	NSD	—	Yes	.00
Compound	NSD	—	Yes	.00
Effect on others				
Peers	Adults	.03	NSD	—
Family	Adults	.02	Yes	.00
Other	NSD	—	Yes	.03
Behavior				
Take additional risks	Adults	.07	Yes	.00
Toward others	Adults	.02	NSD	—
Avoid other risks	NSD	—	NSD	—

Note. NSD = no significant difference.

jects circled in the closed format and produced in the open one was 5.5. Analyses of variance produced highly significant main effects for format: for beer, $F(1, 390) = 1{,}867$, $p < .00$; for marijuana, $F(1, 389) = 1{,}468$, $p < .00$.

There were also significant Format × Group interactions: for beer, $F(1, 390) = 18.67$, $p < .00$; for marijuana, $F(1, 389) = 10.65$, $p < .00$, reflecting a tendency for teens to circle more consequences than adults but to produce about as many.

Valence of consequences. Table 7 compares the mean numbers of good and bad consequences. Three-way ANOVAs yielded significant Valence × Format interactions: for beer, $F(1, 390) = 395.8$, $p < .00$; for marijuana, $F(1, 390) = 448.3$, $p < .00$. On average, approximately 10% of the consequences produced in the open-ended questionnaire were good ones, compared with 20% of the consequences circled in the closed-ended questionnaire. The preponderance of bad consequences produced highly significant overall main effects for valence: for beer, $F(1, 390) = 1197$, $p < .00$; for marijuana, $F(1, 390) = 1{,}348$, $p < .00$.

Type of consequences. Table 8 presents the percentage of subjects mentioning each type of consequence at least once as a function of question, group, and format. As mentioned, the consequences on the closed list were coded into the bottom-level type categories used for the open-ended responses. Most of the categories produced with any frequency by subjects appeared at least once on the lists. Almost every category that appeared on the closed lists was chosen at least once by the great majority of subjects. Thus, subjects seemed to recognize every category of possible outcome in the coding scheme, even if they did not list it spontaneously. All of the zeros in the Closed columns indicate type categories absent from the closed lists. Few of these were produced by very many adolescent subjects in the open-ended format, indicating that the lists were fairly complete for them. However, between 10% and 20% of adults produced consequences in these categories. The category of "behavior toward others" was not included in the marijuana list but was included in the beer list as "fight/argue." This category was produced by about one sixth of subjects for both behaviors, while being circled by about 90% of subjects in the beer list.

Discussion

Adolescents Versus Adults

The strongest overall pattern in these results is how similarly the adolescents and adults responded. Both groups produced more bad than good consequences for yes decisions and similar numbers for no decisions. Both groups provided significant numbers of negated consequences only for no decisions. Both groups produced higher rates of social reactions for no decisions.

Although there were some differences, they were relatively small, especially when one considers the strong claims often made regarding the differences between adults' and adolescents' perceptions of risk. Adults provided somewhat more consequences, although the difference was significant only for three of the six one-time behaviors in the open-ended condi-

Table 5
Mean Number and Standard Deviations of Consequences Produced as a Function of Group, Frequency, and Valence

	Adults				Teens			
	One-time		Regular		One-time		Regular	
Question	Good	Bad	Good	Bad	Good	Bad	Good	Bad
Beer								
M	0.71	3.97	0.55	5.64	1.70	3.57	0.78	4.65
SD	0.90	1.78	0.88	2.56	0.92	2.36	1.04	2.35
n	31	31	136	136	30	30	129	129
Marijuana								
M	1.13	4.13	0.33	5.52	1.08	3.82	0.81	5.27
SD	0.92	2.30	0.65	2.87	1.12	1.92	1.11	2.76
n	69	69	63	63	67	67	63	63

Table 6
Percentage of Respondents Mentioning Each Category at Least Once as a Function of Question, Group, and Frequency

Type of category	Beer				Marijuana			
	Adults		Teens		Adults		Teens	
	One-time	Regular	One-time	Regular	One-time	Regular	One-time	Regular
Social reactions								
Peers	**29**	27	**63**	35	**39**	37	**52**	44
Family	**45**	15	**60**	19	**29**	13	**60**	24
Other authority	**87**	28	**60**	47	**48**	24	**58**	49
Personal effects								
Physical	35	**57**	60	**64**	**68**	54	64	**81**
Psychological	48	**60**	**73**	43	**80**	56	52	**54**
Mental	6	**28**	3	**21**	13	**38**	16	**44**
Assets	23	**60**	7	**33**	9	**46**	7	**38**
Compound	65	**69**	70	**71**	45	**49**	**57**	51
Effects on others								
Peers	**13**	9	**13**	5	6	**11**	1	**3**
Family	3	**17**	0	**9**	3	**21**	1	**5**
Others	10	10	**7**	6	3	**6**	3	**11**
Behavior								
Additional risks	**45**	44	23	**26**	46	**57**	16	**22**
Toward others	19	**28**	**10**	7	17	17	1	**16**
Avoid risk	**3**	1	**3**	2	**17**	0	**3**	0

Note. The frequency condition (one-time or regular) producing the higher rate of mentions for each group is indicated by bold numbers.

tion. Adolescent subjects mentioned somewhat more negated consequences of no decisions—perhaps because they were better able to think simultaneously about doing and not doing the focal behavior, or perhaps because they found it harder to think about not doing an action (leading them to convert the task to thinking about doing it). Adolescents were slightly more likely to mention social reactions, for both yes and no decisions. The direction of this difference fits the common wisdom that adolescents are subject to peer pressure, although its magnitude seems much smaller than one might expect. Adults more frequently mentioned additional risk behaviors and effects on others, perhaps showing a broader perspective (as well as concern for themselves among those others). There were no systematic differences in frequency for the most common category—personal effects—or for its most common subcategories.

At least as far back as Aristotle, adolescents have been viewed as possessing unrealistic confidence in their own safety: "The young are full of passion, which excludes fear; and of hope, which inspires confidence" (cited in Welldon, 1966, p. 166). Elkind (1967) proposed a widely cited theoretical basis for such feelings of invulnerability, arguing that youths entertain "personal fables" that include a belief in indestructibility. The present results provide no support for this claim. These youths saw roughly the same possibilities as did their parents, should they take or avoid the focal behaviors. In a review of the literature, we found remarkably little evidence for a uniquely adolescent perception of invulnerability, although there is considerable evidence of adults seeing themselves as less at risk than others (Quadrel, Fischhoff, & Davis, 1993; Weinstein, 1980, 1987b). In a study eliciting estimates of the probability of various adverse

Table 7
Mean Number and Standard Deviations of Consequences Mentioned as a Function of Group, Format, and Valence

Question	Adults				Teens			
	Open		Closed		Open		Closed	
	Good	Bad	Good	Bad	Good	Bad	Good	Bad
Beer								
M	0.55	5.64	4.00	21.05	0.78	4.65	6.08	22.28
SD	0.88	2.56	2.66	6.62	1.04	2.35	3.56	8.19
n	136	136	62	62	129	129	64	64
Marijuana								
M	0.33	5.52	4.57	20.93	0.81	5.27	4.97	23.98
SD	0.65	2.87	3.47	5.68	1.11	2.76	3.27	4.69
n	63	63	136	136	63	63	128	128

Table 8
Percentage of Respondents Mentioning Each Category at Least Once as a Function of Question, Group, and Format

Type of category	Beer				Marijuana			
	Adults		Teens		Adults		Teens	
	Open	Closed	Open	Closed	Open	Closed	Open	Closed
Social reactions								
Peers	27	**76**	35	**84**	37	**65**	44	**86**
Family	15	**97**	19	**88**	13	**93**	24	**93**
Other authority	28	**97**	47	**92**	24	**96**	49	**98**
Other	10	**24**	2	**41**	5	**71**	19	**85**
Personal effects								
Physical	57	**98**	64	**97**	54	**100**	81	**100**
Psychological	60	**100**	43	**98**	56	**96**	54	**95**
Mental	28	**74**	21	**73**	38	**93**	44	**98**
Asset	60	**100**	33	**95**	46	**84**	38	**83**
Compound	69	**100**	71	**95**	49	**100**	51	**100**
Other	26	**69**	22	**66**	**21**	0	**33**	0
Effects on others								
Peer	**9**	0	**5**	0	**11**	0	**3**	0
Family	**17**	0	**9**	0	**21**	0	**5**	0
Other	10	**87**	6	**80**	6	**96**	11	**93**
Behaviors								
Additional risks	44	**74**	26	**81**	57	**92**	22	**97**
Toward other	28	**94**	7	**88**	**17**	0	**16**	0
Avoid risk	**1**	0	**2**	0	0	0	0	0
Other	14	**55**	0	**72**	14	**93**	11	**98**

Note. The format condition (open or closed) producing the higher rate of mentions for each group is indicated by bold numbers.

(experimenter-provided) consequences, we found similar degrees of perceived invulnerability among adults and adolescents (Quadrel et al., 1993). We have also found similar response patterns among adolescents and adults drawn from these populations when asked to assess the extent of their own knowledge regarding risk behaviors (Quadrel, Fischhoff, Fischhoff, & Halpern, 1992).

Taking Versus Avoiding Risks

Previous research on adolescents' perceptions of the consequences involved in risk decisions asked subjects only about what would happen if they chose to take a risk. That research strategy assumes a symmetrical relationship between the perceived consequences of accepting and rejecting a risky option. The present evidence indicates that this is not a warranted assumption.

For each of six decisions about one-time behaviors, both adult and adolescent subjects produced more consequences for yes decisions than for no decisions. One explanation of this difference is that it is easier to think about action than about inaction, which is often less well defined. As a result, inaction provides a poorer (cognitive) starting point for generating possibilities. Analogous asymmetries can be found in social perception (Nisbett & Ross, 1980), judgments of correlation (Beyth-Marom, 1982), logical reasoning (Wason & Johnson-Laird, 1972), and hindsight judgments (Fischhoff & Beyth, 1975).

This explanation of the psychological difference between taking and not taking an action is supported by the observation that negated consequences were mentioned almost exclusively as results of not doing the focal action. Perhaps people sometimes find it easier to think about *in*action by focusing on the complementary action. They almost never do the opposite (talk about the good or bad consequences that they may be missing by taking an action). By focusing on direct consequences of their actions, people may neglect the opportunity costs of actions that they have foregone (Dawes, 1988). It is an open empirical question whether decisions are naturally formulated in terms of one alternative or competing ones.

Yet another reflection of the asymmetry between doing and not doing was the interaction between valence and version. The thought of taking the focal action produced four times as many bad consequences as good ones. The thought of not taking it produced roughly equal numbers of good and bad consequences. Again, this was true for adults and for teens, as well as for all six of the behaviors studied here (although the ratios varied somewhat across behavior).

As mentioned, more consequences were produced for doing than for not doing. However, the size of the difference varied with the type of consequence. The most striking deviation from the general pattern was with "social reactions of peers." That possibility was actually mentioned more frequently as a consequence of not engaging in the focal behavior. Most of the specific instances dealt with potential losses of social standing (e.g., they will call me a nerd; they'll get mad at me).

In Bauman's (1980) pioneering work, youths judged the likelihood of 54 possible consequences of using marijuana. The positive consequences judged to be most likely were ones bringing direct and immediate physical or psychological satisfaction. Bauman (1980, p. 114) expressed surprise at the low likelihood

assigned to "frequent explanations of drug use," such as being liked by friends, feeling more grown-up, and feeling closer to others. Our results suggest that such consequences are less salient when youths consider using marijuana (Bauman's question) than when they consider declining it. It will be hard to understand adolescents' (or adults') decision making if one fails to elicit the perceptions associated with not taking an action. It will be hard to influence their decision making with communications that focus on what happens if they take a risk but ignore the consequences of avoiding it.

One-Time Versus Regular Behavior

Some earlier studies have not specified how often a risk behavior is to occur, leaving respondents to guess. In most cases, the list of consequences contains some items (e.g., addiction) strongly suggesting a regular behavior. In other cases, studies ask about the consequences of engaging in a regular behavior in no specific context (or, implicitly, in the variety of specific contexts in which it might normally occur). Those studies compared these judgments with subjects' self-reports of their behavior. Although that comparison seems reasonable, it assumes that subjects' behavior patterns are determined by their perceptions of the consequences of regular behaviors.

In contrast, we speculated that behavioral patterns are built up, decision by decision. As a result, the first three questions on each of our questionnaires asked about the consequences of a one-time action in a (briefly described) specific setting. To test the effects of this design feature, we also asked about the consequences of regularly engaging in two of our six focal behaviors. The comparison showed that decreased mental functioning and lost assets were much more likely to be mentioned as consequences of regular behaviors than of one-time ones. On the other hand, social reactions of peers were more commonly cited as consequences of one-time decisions. Partly as a result of these differences, the ratio of negative to positive consequences was also much larger from the long-term perspective. Our one-time decisions all involved a social context and therefore provided a prompt for such consequences. However, so would many real-world decisions.

One-time and regular behaviors elicited roughly the same number of consequences. Thus, neither kind of decision was inherently less evocative. However, each did direct respondents to somewhat different concerns. One interpretation of the differences might be that asking about regular risk behaviors evoked knowledge of long-term detrimental effects that were swamped by short-run concerns when one-time decisions were considered. If decisions are made on a one-time basis, then studying that perspective should provide better predictions of risk behaviors. Addressing that perspective should also provide better opportunities to affect those behaviors.

Open- Versus Closed-Ended Questionnaires

Our subjects circled many more possible consequences on the lists drawn from the previous studies than they produced on our open-ended questionnaires. A simple explanation is that circling is easier than writing. That explanation would not, however, account for the differences in the distributions of consequence types and valences, such as the higher rate of good consequences in the closed-ended format. It should not be harder to write down one kind of consequence than another.

With the open-ended format, subjects were presumably unable to think of some possible consequences that they recognized immediately, when seeing them on a list. The specific consequences that are relatively less frequent in the open-ended task might be ones that people know about, in principle, but tend to neglect when actually making decisions (in an open-ended world). There were few consequences on the fixed lists so exotic that respondents would never have thought of them. What counts, though, is which consequences actually occupy people.

A more controversial contributing factor is the role of suggestion in shaping subjects' responses. Seeing a consequence on a list suggests that someone (perhaps an expert) views it as potentially relevant. The great length of the fixed lists presumably suggested that respondents were expected to reject many of them. That should have reduced any implicit pressure to pick particular consequences. Nonetheless, the composition of the list may have suggested the kinds of consequences to be chosen. For example, according to our coding, 35%–40% of the lists' consequences were positive. Among the consequences that our subjects circled on those lists, 17%–23% were positive. This rate of positive consequences lies between the lists' base rates and the 5%–13% positive consequences on our open-ended tasks. The specific wording of individual consequences may have inadvertently suggested how they were to be judged.

Any such suggestion effects would reduce the validity of measurement based on fixed lists. That methodological threat would have to be compensated by some advantage, such as having all subjects respond to the same consequences, phrased in the same way, or as a way to overcome differences in literacy levels. As mentioned, however, we have administered this procedure to high-risk (and lower literacy) youths (Beyth-Marom, Austin, Fischhoff, Palmgren, & Quadrel, 1992). Arguably, a long fixed list may be more demanding than our open-ended form (with no words beyond those that subjects produce and an explicit statement not to worry about spelling or grammar).

Although its analysis is (much) more arduous, the open-ended format seems closer to simulating the circumstances under which risk decisions are actually made. If more structured and standardized tasks are desired, then an open-ended study might be a useful step in their development. It could help identify the consequences relevant to subjects and the terms in which they are intuitively expressed, in addition to providing a complementary source of insight into people's thinking about risk. We have used this strategy in refining the often ambiguous questions used to study adolescents' perceptions of the magnitude of risks (Fischhoff & Quadrel, 1991; Quadrel, 1990).

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