Sensation seeking, impulsive decision-making, and risky sex: implications for risk-taking and design of interventions

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Received 4 December 1998; received in revised form 11 June 1999; accepted 26 June 1999

Abstract

In an HIV prevention study, 2949 ninth-grade students in 17 high schools in two Midwestern U.S. cities were administered scales measuring sensation seeking and impulsive decision-making and their separate and combined relationships to a number of indicators of sexual risk-taking. Measures of sexual risk-taking included intentions to have sex, ever had sex, number of lifetime sexual partners, been pregnant or caused a pregnancy, used a condom, used marijuana, had unwanted sex when drunk, had unwanted sex under pressure, said no to sex, used alcohol or partner used alcohol before sex. Strong associations were observed between each of the measures and sexual risk-taking for most of the indicators. Strongest associations were found among sexually active students high on both sensation seeking and impulsive decision-making and weakest associations among students low on both measures. Implications for design of interventions in health campaigns are discussed. © 2000 Elsevier Science Ltd. All rights reserved.

Keywords: Sensation seeking; Impulsive decision-making; Communication; HIV; Alcohol; Sexual risk-taking; Personality; Prevention

1. Introduction

The role of a “risky personality” type in health behaviors and the importance of designing...
programs specifically to reach individuals on the basis of their different needs was emphasized recently by Caspi and associates following a longitudinal study of young males and females in New Zealand from age 3 to 21 on a wide range of behavioral characteristics, including health risk behaviors (Caspi et al., 1997). The authors noted that

...the origins of a personality type at risk for health-risk behaviors may be found early in life and...individual differences in personality may influence steps in the persuasion process. Thus, different types of individuals may attend to, comprehend, accept, and retain different types of messages.... If we know the personality characteristics of a target audience, it may be possible to tailor campaigns to zero-in on the characteristic motivations, attitudes, and feelings of the audience.... Knowledge of the psychological characteristics that motivate you to engage in health-risk behaviors may thus help public health officials choose more effective campaigns that would motivate risk takers to minimize harm. (p.1061)

The recommendation of Caspi and associates is consistent with findings from a substantial body of research on communication and health campaigns which has established that interventions designed to meet higher needs for *novelty* and *sensation*1 considerably advance our ability to capture the attention of target individuals likely to engage in health-risk behaviors, enhance information processing, and motivate attitude and behavior change (Donohew, Helm, Lawrence & Shatzer, 1990; Donohew, Lorch & Palmgreen, 1991; Donohew, Palmgreen & Duncan, 1980; Lorch et al., 1994; Palmgreen & Donohew, in press; Palmgreen et al., 1991). This research draws on Zuckerman's work on sensation seeking (see, e.g., Zuckerman, 1979, 1988, 1991, 1994a) which defines it as a trait involving

the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience (1994, p.27).

Sensation seeking plays a crucial role both in susceptibility to drug and alcohol use (e.g., Donohew and associates found use of alcohol to be twice as high among high sensation seekers (HSS) as among low) and in the types of messages and other interventions likely to be attended (1990, 1991, and 1994). HSS are receptive to stimuli that are intense, novel and

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1 According to Bardo, Donohew, and Harrington (1996), the need for novelty and sensation finds biological expression through the mesolimbic dopamine reward pathway, which presumably has evolved because it subserves behaviors that are vital to survival, and particularly because it is posited to be responsible for producing reinforcement (Glickman & Schiff, 1967; Vaccarino, Schiff, & Glickman, 1989). Bardo and associates (Bardo et al., 1993; Bardo & Hammer, 1991; Bardo, Neisewander & Pierce, 1989) have suggested that novelty-seeking and drug-seeking behaviours may involve activation of a common neural substrate (in the mesolimbic dopamine system), supporting the possibility that novel or high sensation stimulation may substitute for drug reward. A number of investigators have found biological connections with novelty and sensation seeking, including levels of the male hormone, testosterone and of monoamine oxidase (MAO-B) the brain-specific enzyme which breaks down dopamine and other neurotransmitters (Zuckerman, 1979, 1988, 1994), and the D4 dopamine receptor gene which was found in work reported recently by teams conducting research at the National Institute of Health and in Israel (Benjamin et al., 1996; Cloninger, Adolfson, & Svrakic, 1996; Ebstein et al., 1996).
arousing; stimuli producing lower levels of arousal may be considered “boring” and cause the HSS to seek alternative sources of stimulation. Low sensation seekers (LSS) tend to reject stimuli that are highly intense, preferring the familiar and less complex.2

In order to attract and hold the attention of HSS, the campaigns employed messages and activities possessing greater sensation value, identified in focus groups as exhibiting higher levels of the following attributes: (a) novel, creative, or unusual; (b) complex; (c) intense, emotionally powerful or physically arousing; (d) graphic or explicit; (e) somewhat ambiguous; (f) unconventional; (g) fast-paced; or (h) suspenseful (Donohew, Lorch & Palmgreen, 1998; Donohew, Palmgreen & Lorch, 1994; Lorch et al. 1994). Support for the effectiveness of this approach has been found in a number of subsequent studies. In one of them, for example, involving a television campaign featuring high sensation value messages embedded in like programs, 72% of callers to a hotline were found to be HSS (Palmgreen et al., 1995).

Other research has indicated that although HSS are more likely to become involved in risky situations (e.g., Donohew et al., 1990, 1998) it may be that portion of them who also are impulsive decision-makers (Langer, Zimmerman, Warheit & Duncan, 1993) who are more likely to actually engage in the risky behaviors (Donohew et al., 1997; Zimmerman & Donohew, 1996; Zimmerman, Novak & Donohew, 1997). The authors have operationally defined impulsivity, or an impulsive decision-making style, not as a trait, but as one end of a continuum which varies from those styles which can be considered very rational to those which are consistently impulsive. Several personality researchers have viewed impulsivity and sensation-seeking as related personality traits (Buss and Plomin, 1975; Eysenck & Eysenck, 1977; Zuckerman, 1983; Zuckerman, Kuhlman, Joireman, Teta & Kraft, 1993). In what he has described as the biological foundations of a basic dimension of personality, Zuckerman has combined impulsivity and sensation seeking into a single dimension of a personality scale (Zuckerman et al., 1993). He concludes (1994) that “while [impulsivity is] not an equivalent or supraordinate of sensation seeking, [it] is a highly related trait, particularly in its nonplanning and risk-taking aspects”.

Based on the research to date, it is proposed that sensation seeking and impulsive decision-making are complementary components of a decision-making process that may or may not be “rational”. They thus may have interactive effects on risky sexual behaviors, including alcohol use in the context of sexual decision-making. Therefore, the combination of these two characteristics could be expected to place individuals involved at substantially greater risk of HIV infection, sexually transmitted diseases, and pregnancy, making them a prime target group for health interventions.

In this paper, we report on the first phase of a project which has grown out of separate programs of research on sensation seeking and communication processes by Donohew and associates, and on decision making styles by Zimmerman and associates. The paper examines associations among these characteristics and a range of sexual risk-taking behaviors and other variables affecting the likelihood of engaging in risky sex, including initiating sex at an early age, having multiple sexual partners, unprotected sex, and sex following use of alcohol and

2 This research was supported by Grant No. AA10747 from the National Institute on Alcohol Abuse and Alcoholism (Lewis Donohew and Rick Zimmerman, PIs)
other drugs. The broad, long-term goals of the research described here are to better understand the relationship of sensation seeking and decision-making processes with alcohol use and risky sexual behaviors in adolescents and to develop and test more effective mass media and school-based interventions taking these processes into account.

1.1. Prevention programs

On the basis of preliminary research reported later in this article, we suggest two reasons for the generally weak results of sex/HIV prevention education: (1) they generally subscribe to a rational model of decision-making, i.e., they assume some cognitive heuristic whereby individuals carefully weigh possible choices and outcomes and rationally choose behaviors as they go through their lives; and (2) they assume that all individuals will respond to the same kinds of messages, using the same sorts of cognitive heuristics for making decisions and selecting situations and behaviors (Zimmerman & Vernberg, 1994). There is a lot of evidence to refute both of these assumptions, among them reviews of the effectiveness of school-based studies which, overall, show a discouraging lack of success and evidence of individual differences in risk-taking involving substance use, sexual behaviors, and combinations of the two. Although the newer school-based programs are better designed to teach specific skills, interventions which are more closely attuned to attracting and holding the attention of prime target audiences paying special attention to both their observed needs (e.g., instruction on dealing with their increased likelihood of risk-taking and their attention processes (need for more novelty in order to maintain attention) also are likely to be more effective.

In this article, we report on the first phase of a research project which has grown out of separate programs of research on sensation seeking and on decision making styles, both involving interventions designed to attract, hold the attention of and persuade individuals who exhibit these health-risk behaviors to engage in safer health practices (Donohew et al., 1997; Zimmerman et al., 1997). The paper examines associations among these characteristics and a range of sexual risk-taking behaviors and other variables affecting the likelihood of engaging in risky sex.

Designing effective interventions for use in comprehensive prevention campaigns is thus a difficult task. Our previous laboratory research strongly indicates the effectiveness of utilizing message sensation value (the degree to which formal and content audio-visual features of televised messages elicit sensory, affective, and arousal responses) and persuasive appeals stressing problems caused by the behaviors and alternative activities in order to target sensation seeking teens and young adults with prevention public service announcements (PSAs). Besides being a strong predictor of such risky behaviors as alcohol use and risky sex (Donohew et al., 1997; Zimmerman et al., 1997), sensation seeking is associated with attention to novel and arousing messages and participation in a greater variety of activities, many of which are themselves exciting or stimulating.

An extensive series of experiments and field studies on improving the effectiveness of public health campaigns (Donohew et al., 1990, 1991, 1994; Lorch et al., 1994; Palmgreen et al., 1991; Zimmerman et al., 1997) has been guided by an individual differences model of information exposure (Donohew et al., 1980, 1998; Donohew, Finn & Christ, 1988). The central assumption of the theoretical model is that human beings have individual levels of need for
stimulation at which they are most comfortable, and that attention is a function primarily of an individual's level of need for stimulation and the level of stimulation provided by a stimulus source. Thus, messages with high sensation value are required in order to attract and hold the attention of individuals who are HSS. The sensation value of a message is defined by Palmgreen and Donohew (in press) and by Lorch and associates (1994, p.395) as the ability to elicit sensory, affective, and arousal responses. In our previous research, HSS responded more favorably (in terms of both attitude and intent to call a prevention hotline) than LSS to PSAs designed and professionally produced to be high in sensation value and which featured alternative stimulating activities (Donohew et al., 1991; Palmgreen et al., 1995). However, LSS also were attracted to such messages. Low sensation value PSAs, on the other hand, were effective with LSS, but had very little attraction for highs. Thus, a strategy of designing messages or instruction primarily for the target audience most likely to engage in the activities would be expected to reach and reinforce peripheral audiences as well.

2. Method

2.1. Subjects

In the current project, we have been working with 17 high schools: 10 in the greater Louisville area and seven in the greater Cleveland, Ohio, area. We targeted ninth grade as the location of most of the health students in the high schools, and thus recruited primarily ninth grade students for the project. Out of 4702 students in the 17 schools, 63%, or 2949, returned affirmative consent forms and completed surveys in the project, with 7% returning negative consent forms and 30% not returning forms.

The sample was diverse, as anticipated, with 52.8% female; 49.0% White, 35.8% African–American, 7.5% Hispanic, and 7.7% of other or mixed race. The majority (52.5%) were age 14 at baseline, with most of the rest (35.7%) age 15, and 11% older than 15. Almost all (95.9%) were in ninth grade. Nearly half (45%) reported having had sex at some time in their life; with about 1/3 of those having had one partner, about 11.5% having had two partners, another 11.5% having had six or more partners, and the remainder having between three and five partners. About 70% of those who were sexually active had sex for the first time at age 13 or 14.

2.2. Procedure

Self-administered questionnaires were distributed by trained graduate assistants to subjects who returned both an affirmative parental consent form and completed an assent form. Each student then received a copy of a questionnaire in an envelope bearing the student’s name. As the surveys were distributed, the graduate assistants removed the labels with the student’s name from the manila envelope. The students were then read a prepared statement indicating the overall purpose of the study, procedures, and a statement of confidentiality. Although students were informed of the confidential nature of the survey, ultraviolet ink was used to mark the questionnaires with a unique identification number for each student. The ultraviolet marks
were later written by the research staff using standard ink for coding and scanning of the questionnaires. Approval for this method was obtained from the Research Subjects Review Committee of the investigators' home university.

Given the sensitive nature of the information requested from the students, special care was taken to enhance their privacy, such as using large rooms to allow for separation and development of several versions of the questionnaire printed in different colors and with different question ordering. During data collection, teachers were asked to remain unobtrusive as project assistants answered student questions and concerns. At completion, the research assistants collected the surveys and placed them in a large envelope.

2.3. Instruments

The variables assessed on the baseline survey included: (1) demographics, including age, ethnicity/race, gender, parent education, educational aspirations, and living arrangements; (2) individual difference variables, including sensation seeking, decision making style, self esteem, future orientation; (3) knowledge related to HIV, pregnancy, and contraception; (4) attitudes and beliefs, salience of pregnancy, HIV and alcohol concerns, perceived risk of HIV, and perceived peer sexual activity; (5) exposure to information — talking with peers about HIV, pregnancy, and related topics, as well as exposure to related topics in school; (6) self efficacy, including the ability to refuse sexual advances under various situations, negotiation with partner, and skills related to condom use; (7) intentions — to have sexual intercourse over the next months to years, as well as intentions to use condoms; (8) frequencies of alcohol and marijuana use as well as use in conjunction with sexual behaviors; and (9) sexual behaviors related to intercourse experience and condom and other contraceptive use.

2.4. Scales and individual measures

The key measurements for this paper center on the relationship between sensation seeking and decision making style:

2.4.1. Sensation seeking

The sensation seeking scale was adapted from Zuckerman’s (1978, 1994a) 40-item sensation seeking scale (Hoyle, Stephenson, Palmgreen, Lorch & Donohew, in press). The sensation seeking construct measures risk taking, and thrill seeking activity and contains four sub-dimensions: (1) boredom susceptibility; (2) thrill and adventure seeking; (3) disinhibition; (4) boredom susceptibility. This scale was adapted to adolescents during questionnaire pre-test to 16 items and the wording of several items was simplified to coincide with reading comprehension levels and to make it more culturally sensitive to minority subjects. The final scale had an alpha of 0.79; and confirmatory factor analysis not included here revealed good statistical fit based on a measurement model.

2.4.2. Impulsive decision-making

Although conceptions of impulsivity suggest that impulsive individuals act spontaneously, i.e., without considering consequences, the conceptualization represented in the scale employed
here also focuses on the cues that these individuals do use to make decisions. It proposes that while rational decision-makers use beliefs about consequences of their actions, impulsive decision-makers use non-cognitive cues, including affective and physiological cues (as opposed to merely ignoring consequences), to make decisions. The 11-item decision-making style scale (Zimmerman and Langer, in preparation) has been shown to be moderately correlated with the Eysencks' (1977) more narrowly focused impulsivity scale (correlations of 0.31 to 0.65 in three samples of 100–650 high school students) and to be more strongly related to risky sexual behavior (e.g., Langer and Tubman, 1997; also Zimmerman, unpublished data). Internal consistency is comparable to that of the Eysenck scale (generally in the 0.7 to 0.8 range), with a similar 1-year test–retest correlation in high school students of approximately 0.5. The final 9-item decision making style scale used here contains two components: the extent to which an individual is a rational decision-maker and the amount of impulsiveness in the situational decision making process. The alpha was 0.71.

2.5. Statistical analysis

Descriptive statistics are used to highlight the percentages who engage in various outcome behaviors. Inferential statistics, chi-square tests and analysis of variance models, are used to test differences in the relative contributions of sensation seeking and decision making as well as their interactive effects when controlling for race and gender. The variables of sensation seeking and decision making style were dichotomized into high and low based on a median split by race and gender. Though the limitations of imposing this artificial divide is obvious, there exists no established point between highs and-lows in the literature.

3. Results

In the analyses reported here, both sensation-seeking and decision-making are strongly related to risk-taking behaviors. As shown in Table 1, all of the variables other than “said no to sex” were significantly related to both sensation-seeking and decision-making style, with all but one of the relationships in the expected direction: i.e., HSS and impulsive decision-makers were more likely to engage in risky behaviors. The one exception was for having a condom (either with them or “anywhere”). HSS and impulsive decision-makers were more likely to have a condom rather than less likely to do so. In retrospect, this is not a highly surprising finding, given that HSS are more likely to engage in sexual intercourse. As reported in Table 1, both the HSS and impulsive decision makers not only were more likely to engage in intercourse, but also were more likely to say they had been sexually close to someone but engaged in some behavior other than intercourse.

Analyses (not shown in table) were also conducted separately for males and females. Results are not shown in a separate table because they were generally similar for both groups except for the following: results for females were identical to those for the entire sample, except for one additional significant finding: high sensation-seekers were more likely to have said no to sex (perhaps putting themselves in situations to do so more often). For males, there was one additional significant finding and three findings that had been significant for the entire sample.
that were not significant. Rational decision-makers were more likely to have said no than impulsive decision-makers. Neither sensation-seeking nor decision-making was significant for having unwanted sex under pressure, and sensation-seeking was not significant for having unwanted sex when drunk.

As shown in Table 2, when both sensation-seeking and decision-making style were entered into logistic regression equations with each of the risk-taking variables as outcome measures, both sensation-seeking and impulsive decision-making were significant correlates of almost all of the outcome variables. The only exceptions were that neither variable was related to saying no to sex, and having unwanted sex under pressure was significantly related to impulsive decision-making but not to sensation-seeking.

In the introduction to this paper it was suggested that although HSS are more likely to get themselves into risky situations, it may be that portion of them who also are impulsive decision-makers who are more likely to engage in risky behaviors. As shown in Table 2, this expectation is substantially supported. In essence, the two risk factors suport each other, with LSS who are also rational decision makers engaging in risky sexual behaviors the least and HSS who are also impulsive decision-makers engaging in these behaviors the most. There is not a clear distinction between low sensation seeking impulsive decision makers and high sensation seeking rational decision makers, but the behaviors of individuals in these subgroups fall between the two extremes.

Results of risk-taking behaviors for those sexually active are shown in Tables 3 and 4. Sensation-seeking was significantly related to using alcohol before sex in the last year and ever using marijuana before sex. Impulsive decision-making was related to having used alcohol before sex in the last year, using alcohol before sex the last time, one’s partner using alcohol before sex the last time, never refusing unsafe sex, ever using marijuana before sex, and having five or more partners in their lifetime.

Table 1
Relationship of risk-taking behaviors to sensation seeking and impulsive decision-making (%)

<table>
<thead>
<tr>
<th></th>
<th>HSSa</th>
<th>LSSb</th>
<th>p</th>
<th>IDMc</th>
<th>RDMd</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever had sex</td>
<td>46.1</td>
<td>33.1</td>
<td>***</td>
<td>49.8</td>
<td>32.0</td>
<td>***</td>
</tr>
<tr>
<td>Ever used alcohol</td>
<td>80.4</td>
<td>65.2</td>
<td>***</td>
<td>81.1</td>
<td>66.2</td>
<td>***</td>
</tr>
<tr>
<td>Ever used marijuana</td>
<td>53.4</td>
<td>32.0</td>
<td>***</td>
<td>52.6</td>
<td>34.6</td>
<td>***</td>
</tr>
<tr>
<td>Have condom</td>
<td>51.6</td>
<td>43.1</td>
<td>***</td>
<td>53.6</td>
<td>42.6</td>
<td>***</td>
</tr>
<tr>
<td>Intends to have sex in next 18 months</td>
<td>23.8</td>
<td>14.7</td>
<td>***</td>
<td>26.3</td>
<td>14.3</td>
<td>***</td>
</tr>
<tr>
<td>Said no to sex</td>
<td>55.1</td>
<td>56.3</td>
<td>ns</td>
<td>53.5</td>
<td>57.3</td>
<td>ns</td>
</tr>
<tr>
<td>Been sexually close, did something other than sex</td>
<td>46.4</td>
<td>31.7</td>
<td>***</td>
<td>45.5</td>
<td>33.8</td>
<td>***</td>
</tr>
<tr>
<td>Had unwanted sex under pressure</td>
<td>13.8</td>
<td>10.1</td>
<td>**</td>
<td>15.2</td>
<td>9.2</td>
<td>***</td>
</tr>
<tr>
<td>Had unwanted sex when drunk</td>
<td>9.2</td>
<td>5.9</td>
<td>**</td>
<td>10.4</td>
<td>5.4</td>
<td>***</td>
</tr>
</tbody>
</table>

a HSS: High Sensation Seekers.
b LSS: Low Sensation Seekers.
c IDM: Impulsive Decision-Makers.
d RDM: Rational Decision-Makers.
e Among those not sexually active.

* p < 0.001; **0.001 ≤ p ≤ 0.01; ***0.01 ≤ p ≤ 0.05; ns p > 0.05.
Table 2
Joint relationship of sensation seeking and impulsive decision-making to risky behavior

<table>
<thead>
<tr>
<th>Event</th>
<th>LSS&lt;sup&gt;a&lt;/sup&gt;/RDM&lt;sup&gt;b&lt;/sup&gt;</th>
<th>HSS&lt;sup&gt;c&lt;/sup&gt;/RDM</th>
<th>LSS/IDM&lt;sup&gt;d&lt;/sup&gt;</th>
<th>HSS/IDM</th>
<th>HSS:LSS</th>
<th>IDM:RDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever had sex</td>
<td>28.3</td>
<td>37.6</td>
<td>44.4</td>
<td>53.1</td>
<td>1.5 ***</td>
<td>1.9 ***</td>
</tr>
<tr>
<td>Ever used alcohol</td>
<td>60.5</td>
<td>74.9</td>
<td>74.9</td>
<td>84.9</td>
<td>1.9 ***</td>
<td>1.9 ***</td>
</tr>
<tr>
<td>Ever used marijuana</td>
<td>26.6</td>
<td>46.8</td>
<td>42.6</td>
<td>58.9</td>
<td>2.3***</td>
<td>1.7 ***</td>
</tr>
<tr>
<td>Have condom</td>
<td>39.0</td>
<td>47.8</td>
<td>51.9</td>
<td>54.9</td>
<td>1.3 ***</td>
<td>1.5 ***</td>
</tr>
<tr>
<td>Intends to have sex in next 18 months&lt;sup&gt;e&lt;/sup&gt;</td>
<td>12.3</td>
<td>20.9</td>
<td>22.6</td>
<td>29.6</td>
<td>1.6 ***</td>
<td>2.0 ***</td>
</tr>
<tr>
<td>Said no to sex</td>
<td>58.3</td>
<td>55.7</td>
<td>52.2</td>
<td>54.5</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Been sexually close, did something other than sex</td>
<td>27.9</td>
<td>42.8</td>
<td>39.1</td>
<td>49.6</td>
<td>1.7 ***</td>
<td>1.5 ***</td>
</tr>
<tr>
<td>Had unwanted sex under pressure</td>
<td>8.0</td>
<td>11.1</td>
<td>14.1</td>
<td>16.0</td>
<td>1.3</td>
<td>1.7 ***</td>
</tr>
<tr>
<td>Had unwanted sex when drunk</td>
<td>4.8</td>
<td>6.0</td>
<td>7.8</td>
<td>11.9</td>
<td>1.4 *</td>
<td>1.9 ***</td>
</tr>
</tbody>
</table>

<sup>a</sup> LSS: Low Sensation Seekers.
<sup>b</sup> RDM: Rational Decision-Makers.
<sup>c</sup> HSS: High Sensation Seekers.
<sup>d</sup> IDM: Impulsive Decision-Makers.
<sup>e</sup> Among those not sexually active.

*p < 0.001; **0.001 ≤ p ≤ 0.01; ***0.01 ≤ p ≤ 0.05; ns p > 0.05.
When assessing the separate contributions of the two individual difference variables in a multiple logistic regression (see Table 4), results were similar. Both variables contributed to using alcohol before sex in the last year and ever using marijuana before sex, and impulsive decision-making was related to using alcohol before sex the last time, partner using alcohol before sex the last time, and never refusing unsafe sex.

4. Discussion

Although previous research has separately examined the relationship of sensation seeking and of impulsive decision-making with risky sexual behaviors among adolescents, this paper reports on the first project in which the two are explored simultaneously. The findings not only offer additional support for previous findings that individuals possessing either of these characteristics are more likely to become involved in situations involving health risks, but also indicates that those most likely to engage in risky behaviors are those high on both.

A substantial implication of these findings for HIV intervention studies is that the needs which help bring about the behaviors also offer some clues for designing programs to alter them. It suggests that characteristics associated with the behaviors — such as needs to experience intense, novel, and arousing stimuli — be employed to design successful interventions with these prime target audiences.

<table>
<thead>
<tr>
<th></th>
<th>HSSa</th>
<th>LSSb</th>
<th>p</th>
<th>IDMc</th>
<th>RDMd</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used alcohol before sex</td>
<td>37.5</td>
<td>24.0</td>
<td>***</td>
<td>37.5</td>
<td>24.3</td>
<td>***</td>
</tr>
<tr>
<td>in last year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used alcohol before sex</td>
<td>13.7</td>
<td>9.2</td>
<td>ns</td>
<td>14.6</td>
<td>8.4</td>
<td>*</td>
</tr>
<tr>
<td>last time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partner used alcohol</td>
<td>14.5</td>
<td>11.4</td>
<td>ns</td>
<td>16.4</td>
<td>9.3</td>
<td>**</td>
</tr>
<tr>
<td>before sex, last time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used condom last time</td>
<td>74.2</td>
<td>76.6</td>
<td>ns</td>
<td>74.6</td>
<td>76.4</td>
<td>ns</td>
</tr>
<tr>
<td>Always used condoms,</td>
<td>55.0</td>
<td>58.5</td>
<td>ns</td>
<td>54.3</td>
<td>58.8</td>
<td>ns</td>
</tr>
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<td>last year</td>
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</tr>
<tr>
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<td>30.0</td>
<td>28.0</td>
<td>ns</td>
<td>34.3</td>
<td>23.6</td>
<td>**</td>
</tr>
<tr>
<td>Didn’t use condom when</td>
<td>31.8</td>
<td>27.4</td>
<td>ns</td>
<td>31.2</td>
<td>27.6</td>
<td>ns</td>
</tr>
<tr>
<td>wanted to</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Ever used marijuana</td>
<td>47.0</td>
<td>33.8</td>
<td>**</td>
<td>47.3</td>
<td>34.7</td>
<td>**</td>
</tr>
<tr>
<td>before sex</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Intends to use condoms</td>
<td>54.4</td>
<td>57.6</td>
<td>ns</td>
<td>53.3</td>
<td>58.6</td>
<td>ns</td>
</tr>
<tr>
<td>soon f</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treated for STD</td>
<td>6.2</td>
<td>7.0</td>
<td>ns</td>
<td>5.6</td>
<td>7.6</td>
<td>ns</td>
</tr>
<tr>
<td>5+ lifetime partners</td>
<td>24.2</td>
<td>19.5</td>
<td>ns</td>
<td>25.2</td>
<td>19.0</td>
<td>*</td>
</tr>
<tr>
<td>Been pregnant/cause</td>
<td>14.7</td>
<td>15.5</td>
<td>ns</td>
<td>15.6</td>
<td>14.6</td>
<td>ns</td>
</tr>
</tbody>
</table>

a HSS: High Sensation Seekers.
b LSS: Low Sensation Seekers.
c IDM: Impulsive Decision-Makers.
d RDM: Rational Decision-Makers.
ea Among those who ever drank alcohol.
f Among those who ever used marijuana.
g Among those not currently using condoms.
* $p < 0.001$; **$0.001 \leq p \leq 0.01$; ***$0.01 \leq p \leq 0.05$; ns $p > 0.05$. 
We already know from the separate studies of sensation seeking and of impulsive decision-making cited above that high school-age students who are high on either of these characteristics are particularly difficult to reach using conventional skills-based classroom curricula. These curricula are based on models of rational decision-making and do not sufficiently focus on the role of alcohol in sexual activities, or on alternate high sensation value activities to replace those to be reduced or eliminated. The curricula also might not be sufficiently fast-paced and novel to hold the attention of HSS.

With the addition of impulsive decision-making to the targeted behaviors, design of a successful intervention becomes even more complicated. Routine practice which might be successful at training impulsive decision makers to give appropriate responses in risky situations is likely to receive little interest when the persons also are HSS.

On the basis of findings from the separate programs of research on sensation seeking and impulsive decision-making, supported by those from this study that a combination of these two leads to even greater risk-taking, in order for interventions to reach the highest risk-takers, changes in traditional approaches are needed. Not only is there a need for increases in novelty and excitement value — such as through making media and school-based interventions more novel, complex, emotionally intense, arousing and dramatic — in order to heighten attention and increase learning, but also there needs to be instruction in and rehearsal of risky

Table 4
Joint relationship of sensation seeking and impulsive decision-making to risky behavior — sexually active students only

<table>
<thead>
<tr>
<th>Used alcohol before sex last year</th>
<th>18.4</th>
<th>30.7</th>
<th>29.4</th>
<th>41.8</th>
<th>1.8***</th>
<th>1.7**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used alcohol before sex last time</td>
<td>6.4</td>
<td>10.4</td>
<td>12.8</td>
<td>15.5</td>
<td>1.5</td>
<td>1.8*</td>
</tr>
<tr>
<td>Partner used alcohol before sex last time</td>
<td>7.4</td>
<td>11.6</td>
<td>16.8</td>
<td>16.2</td>
<td>1.2</td>
<td>1.9**</td>
</tr>
<tr>
<td>Used condom last time</td>
<td>75.4</td>
<td>77.4</td>
<td>77.4</td>
<td>72.7</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Always used condoms, last year</td>
<td>56.8</td>
<td>60.9</td>
<td>59.5</td>
<td>52.0</td>
<td>0.9</td>
<td>0.9</td>
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<tr>
<td>Never refused unsafe sex</td>
<td>24.9</td>
<td>21.7</td>
<td>33.1</td>
<td>34.8</td>
<td>1.0</td>
<td>1.7**</td>
</tr>
<tr>
<td>Didn't use condom when wanted to</td>
<td>24.7</td>
<td>31.2</td>
<td>29.7</td>
<td>31.8</td>
<td>1.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Ever used marijuana before sex</td>
<td>29.5</td>
<td>34.4</td>
<td>38.9</td>
<td>51.6</td>
<td>1.6**</td>
<td>1.6**</td>
</tr>
<tr>
<td>Intends to use condoms soon</td>
<td>60.7</td>
<td>56.7</td>
<td>51.7</td>
<td>53.7</td>
<td>1.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Treated for STD</td>
<td>8.2</td>
<td>5.6</td>
<td>7.1</td>
<td>5.7</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>5+ lifetime partners</td>
<td>19.0</td>
<td>18.6</td>
<td>20.4</td>
<td>27.7</td>
<td>1.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Been pregnant/cause pregnancy</td>
<td>16.3</td>
<td>14.6</td>
<td>12.1</td>
<td>16.3</td>
<td>0.9</td>
<td>1.1</td>
</tr>
</tbody>
</table>

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* p < 0.001; **0.001 ≤ p ≤ 0.01; ***0.01 ≤ p < 0.05; ns p > 0.05.
situations. These are situations in which high sensation seeking and impulsive decision-making adolescents have tended to respond in a substantially more risky manner than low sensation seeking rational decision making adolescents. We maintain that such instruction should not only include information specific to the special needs of these targeted adolescents, but also that it be taught in ways more likely to be effective in reducing impulsive decisions. This perhaps should involve behavior rehearsal to increase the probability that the desired behaviors would approach automatic responses. For example, a promising avenue might be introduction of activities such as games or types of role playing interesting enough to cause members of the target audience to try them over and over again until overlearning has occurred and the desired response becomes the most likely one to occur.

References


Ebstein, R., Novick, O., Umansky, R., Priet, B., Osher, Y., Blaine, D., Bennett, E., Nemanov, L., Katz, M., &


