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Sensation seeking and danger invulnerability: Paths to college student risk-taking

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Abstract

This study examines the roles of sensation seeking and invulnerability as predictors of health compromising behaviors in a multiethnic sample of 1690 emerging adult college students (mean age = 19.8, range 18–25 years) from nine US colleges and universities. Participants completed the Arnett Sensation Seeking Inventory and the Adolescent Invulnerability Scale; and reported how often they had participated in a set of health compromising risk behaviors (i.e., substance use, impaired driving, and sexual behaviors) in the 30 days prior to assessment. Sensation seeking and danger invulnerability scores were moderately correlated ($r = .30$). Findings from a series of multivariate Poisson regression analyses suggest that when considered simultaneously as predictors, sensation seeking appears to be a general risk factor associated with engagement in a variety of risk behaviors, whereas danger invulnerability is primarily a factor in those risk behaviors that are less common among peers (e.g., hard drug use, casual sex, and driving while intoxicated).

Keywords

Sensation seeking; Invulnerability; Emerging adulthood; Adolescence; Developmental psychology; Risk behavior

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1. Introduction

Feeling invincible and seeking out intense and novel experiences have long been discussed as distinguishing characteristics of youth. In his influential work, *Adolescence*, Hall (1904) described the bold, “brazen effrontery” (vol. 2, p. 80), new enjoyment of sensation, and high need for excitement that characterize the adolescent years. Since Hall’s time, social-structural changes including expanded educational opportunities and later age of marriage have extended the transition to adulthood, with progressively larger shares of the population attending at least some college before embarking on their adult lives (Côté, 2000). *Emerging adulthood* refers to the period of exploration and extended moratorium between adolescence and adulthood increasingly experienced by youth in industrialized societies (Arnett, 2000). In the US, a number of risk-related health markers, including unintentional injury, binge drinking, drug use, and sexually transmitted infections, peak during these years (Park, Mulye, Adams, Brindis, & Irwin, 2006). Whereas the role of sensation seeking as a risk factor is well-supported and established, the role played by feelings of invulnerability is more controversial and requires further empirical examination. Likewise, there is a need to examine the two factors conjointly in order to better understand their unique and combined contributions to risk-taking behavior.

1.1. Sensation Seeking as a developmental risk factor

Zuckerman (1979) proposed *sensation seeking* as an individual’s need to constantly experience new stimuli, especially those that provide a “rush” of strong physical or emotional arousal. This need to seek out novel experiences has been posited as a biologically-based personality trait and has led to consistent findings, with sensation seeking scores found to predict a variety of risk-taking behaviors across various populations and contexts (Zuckerman, 2007).

Arnett (1994) offered an alternate measure, and slight reconceptualization, of sensation seeking, arguing that some of Zuckerman’s items were outdated, and that others were confounded with risk behaviors that the scale was often used to predict (e.g., substance use, sexual activity). In response, the *Arnett Inventory of Sensation Seeking* focuses on preferences for novel and intense sensations, but avoids specific mention of illegal or rule-breaking behaviors. The Arnett inventory has been shown to predict health risk behaviors including reckless driving, binge drinking, substance use, sex with strangers, and number of sexual partners (Arnett, 1994; Bradley & Wildman, 2002).

Zuckerman (1979) originally proposed that sensation seeking would be expected to increase from childhood into adolescence and to decline thereafter; whereas Arnett (2005) expected it to peak during emerging adulthood. The developmental hypotheses that sensation declines into adulthood has been supported, with studies suggesting that scores are highest in the late teens or twenties (Joinson & Nettle, 2005; Zuckerman, 1994).

1.2. Invulnerability as a developmental risk factor

Many behaviors that are associated with sensation seeking, and that are prevalent among emerging adults (e.g., reckless driving, unprotected sex, substance use), also hold a number

of potentially harmful consequences. Regardless of one's sensation seeking disposition, engaging in highly dangerous behaviors might require ignoring or failing to recognize associated risks such as injury, disease, arrest, and death.

In addition to sensation seeking, another widely-cited explanation for adolescent risk-taking has been Elkind's (1978) proposal that adolescents experience difficulty considering perspectives other than their own, leading to a sense of "personal fable" and invulnerability whereby adolescents feel shielded from harm. A good deal of research does not support Elkind's idea that adolescents consider themselves as less likely than adults to experience negative outcomes (Fischhoff & Parker, 2000; Millstein & Halpern-Felsher, 2002). Further, risk-taking is not limited to adolescence; a number of common health compromising behaviors (e.g., binge drinking, illicit drug use) peak during emerging adulthood (Park et al., 2006), further casting doubt on the argument that pre-adult risk-taking is the result of adolescents' inability to accurately assess risks. Consequently, invulnerability has recently been set aside as a viable explanation for youth risk-taking (e.g., Steinberg, 2007).

However, Lapsley (1993, 2003) has re-conceptualized the personal fable in a way that does not rely on cognitive shortcomings of adolescence, but rather proposes that feelings of invulnerability serve as an adaptive mechanism during the time of separation and individuation that occurs during the transition to adulthood. Thus, invulnerability need not be limited to adolescence, but would be expected to be prevalent during emerging adulthood. From this perspective, some degree of invulnerability may be necessary to separate from parents and to engage in the type of identity exploration that helps one move towards individuation. As such, invulnerability may be adaptive in some respects, but at high levels could be problematic too, by leading to failure to acknowledge or avoid dangerous circumstances.

Lapsley and colleagues have identified two aspects of invulnerability, one focused on attitudes toward physical risks (danger invulnerability) and the other focused on psychological risks (psychological invulnerability), and both measured by the *Adolescent Invulnerability Scale* (Lapsley, 2003). Of the two, *danger invulnerability* is most relevant to risk behaviors, with high scores on that subscale associated with drinking, drug use, smoking (Lapsley, 2003), and with a decreased likelihood of protecting oneself against HIV risks (Ravert & Zimet, 2009).

Arnett (2005) has suggested a possible link between risk perception and risk behavior among emerging adults with regard to substance use, in that emerging adults' extreme optimism might lead them to feel unlikely to experience negative outcomes associated with drinking or drug use. Following this argument, holding unrealistic optimism regarding harmful outcomes might be expected in emerging adulthood, and should predict risk behaviors. Prior research supports that a negative relationship exists between sensation seeking and risk appraisal (Zuckerman, 2007, p. 65).

In sum, although Elkind's original concept of invulnerability as a manifestation of egocentrism has not been empirically supported, the idea of a generalized sense of invulnerability as a risk factor during the transition to adulthood remains viable and in need

of further study. In accord with Lapsley's conceptualization, feelings of general invulnerability to dangerous outcomes might allow emerging adults to engage in behaviors that are developmentally adaptive in nature but also those that hold potentially hazardous consequences.

1.3. Sensation seeking and perceived invulnerability as predictors of health risk behaviors

Although sensation seeking and invulnerability have both often been discussed as contributing factors to emerging adult and college student risk behavior, little research has focused on the relationship between the two constructs, or on the extent to which they may work together to predict risk-taking behavior. Unpublished data have indicated a weak to medium correlation between the two constructs (Lapsley, Personal Communication, March 7, 2008). Some authors have offered speculation that sensation seeking and invulnerability work in conjunction. Arnett (1992) suggested that adolescents might seek the high novel sensations associated with sex, whereas egocentrism allows them to feel protected from experiencing any adverse outcomes. Frankenberger (2004) examined the possibility that adolescents were motivated to smoke by sensation seeking, while feeling protected by an egocentric personal fable. In that study, although no significant association was found between sensation seeking and egocentrism (measured by the *Adolescent Egocentrism Scale*), a .49 correlation was reported between unique invulnerability (defined by the degree to which participants considered their own risk as lower than others' risk) and sensation seeking. The findings suggest that although sensation seeking might not necessarily predict egocentrism, it might be associated with feeling shielded from dangerous outcomes.

Several possible relationships may exist between sensation seeking and danger invulnerability as predictors of risk-taking. One possibility is that danger invulnerability and sensation seeking explain much of the same variability in risk-taking behaviors. In that case, invulnerability would not be expected to emerge as a significant predictor of risk-taking when sensation seeking was also considered as a predictor. The second possibility is that invulnerability and sensation seeking play unique roles as behavioral predictors, whereby high sensation seeking predisposes individuals toward intense and novel actions, whereas danger invulnerability leads individuals to overlook dangers of hazardous behaviors. A third possibility is that the two variables interact, such that individuals inclined toward high sensation seeking engage in risk behavior only to the degree to which they hold perceptions of danger invulnerability that are high enough to lead to overlooking dangers associated with those behaviors.

1.4. The current study

The purpose of the present study was to evaluate the relative contributions of sensation seeking and danger invulnerability as predictors of common health risk behaviors in a multiethnic sample of emerging adult college students. The study tested the hypothesis that sensation seeking and danger invulnerability would be independently associated with marijuana use, hard drug use, prescription drug misuse, casual sex, number of sexual partners, sex while drunk, driving while intoxicated, and riding with an impaired driver. The hypothesis was founded on the premise that sensation seeking and danger invulnerability

represent separate but related theoretical paths to risk-taking, with sensation seeking increasing emerging adult's exposure to risk-taking opportunities, and danger invulnerability enabling risk-taking behavior by suspending or disregarding the perceived (or acknowledged) likelihood of harm resulting from those behaviors.

2. Method

2.1. Participants and procedure

Participants were 1690 students (24% men, 76% women) recruited from courses in psychology, family studies, sociology, and education at nine US colleges and universities. Due to the present study's focus on emerging adulthood as the time of life occurring roughly between 18 and 25 years of age (Arnett, 2005), only students in that age range were included in analysis. The mean participant age was 19.8 years ($SD = 2.03$).

To increase the geographic and ethnic diversity of the sample, we included two recruitment sites in the Northeast, two in the Southeast, one in the Midwest, one in the Southwest, and three in the West. Three of the sites were large state universities, four were smaller state universities, and two were private colleges. In terms of ethnicity, 51.9% of participants identified as White, 9.3% as Black, 6.9% as Asian, and 24.7% as Hispanic. An additional 6.4% indicated that they were of "other" ethnicity, and 0.9% did not provide data on their ethnic background.

Participants received course credit as incentives for their participation. Potential participants were directed to the survey website through printed and emailed announcements. The website required participants to read and agree to a consent form before beginning the questionnaire. The survey was divided into five pages, and 93% of students who logged into the survey website completed all five pages. Identifying information was collected only in order to provide course credit to respondents, and was separated from response data in order to assure confidentiality.

2.2. Measures

2.2.1. Sensation seeking—Sensation Seeking was measured using the Arnett Inventory of Sensation Seeking (1994). This 20-item scale includes two 10-item subscales (novelty and intensity) that were summed for the present study. Respondents report how well each item describes them using a 4-point Likert scale ranging from 1 (*does not describe me at all*) to 4 (*describes me very well*). Reliability (Cronbach's alpha) was calculated as .64 in the current study.

2.2.2. Danger invulnerability—Danger invulnerability was assessed using a 12-item subscale from the *Adolescent Invulnerability Scale* (Lapsley, 2003). Items were answered on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), and assess the degree to which an individual feels immune to external dangers such as injury and physical harm. Sample items include, "I'm unlikely to be injured in an accident" and "There are times when I think I am indestructible". Cronbach's alpha for this subscale was calculated as .87 in the current study.

2.2.3. Health risk behaviors—Participants indicated how many times in the past 30 days they had engaged in a set of health compromising behaviors, using a five-point scale: 0 (*Never*), 1 (*Once or Twice*), 2 (*3–5 Times*), 3 (*6–10 Times*), 4 (*More than 10 Times*). Participants reported the number of times they had (a) smoked marijuana, (b) used “hard drugs (such as ecstasy, cocaine, speed, meth, and ice)”, (c) took prescription drugs to get high, (d) had sex with someone they had met that day (casual sex), (e) had sex while drunk or high, (f) drove a car when they felt at least a little bit drunk, “buzzed”, or “tipsy”, and (g) rode in a car when they knew the driver was drunk or high. Participants also reported the number of different sexual partners they had been with during the 30 days prior to assessment.

2.3. Analysis plan

Mplus release 5.1 (Muthén & Muthén, 2007) was used to estimate a multivariate Poisson regression model. Because students were nested within schools, we controlled for data collection site in order to ensure that standard errors were estimated properly (Raudenbush & Bryk, 2002). Because we did not have enough sites to estimate a multilevel model, we controlled for nesting of participants within sites by creating dummy variables for each site and using the school with the largest number of participants as the reference group (Bengt Muthén, Mplus workshop, 8/21/2007). A sensation seeking X danger invulnerability interaction term was created by centering the main effect terms and calculating the product of those centered scores.

As often occurs when using “count” variables, responses to the health risk behavior items tended to be heavily skewed and to follow a Poisson distribution. Therefore, we used multivariate Poisson regression (cf. Atkins & Gallop, 2007). In Poisson regression modeling, taking the exponential of the regression coefficient yields an incidence rate ratio (IRR), which represents the multiplicative extent to which the expected count would be estimated to increase or decrease with each one-unit increase in the predictor variable.

When zeroes represent 75% or more of the distribution, as was the case in some of the count variables, statistically significant results are unlikely due to a lack of variability. Thus, zero-inflated Poisson (ZIP) models were used in cases where zeroes represented 75% or more of the responses. In a ZIP model, the count variable is split into two separate indicators – a dichotomous variable reflecting whether or not the person engaged in the behavior, and a count variable reflecting the extent of engagement for those who engaged in the behavior. In ZIP models, regression coefficients for the dichotomous variable are expressed as odds ratios (OR), and regression coefficients for the count variable are expressed as incidence rate ratios (IRR). Behaviors for which ZIP models were used included hard drug use, prescription drug misuse, casual sex, and driving while intoxicated.

3. Results

3.1. Descriptive statistics

Table 1 presents descriptive data and gender comparisons regarding participants’ engagement in the various risk behaviors. Consistent with previous research, males tended to

report higher engagement in risk behaviors. The mean sensation seeking score was 52.5 ($SD = 7.1$), with significantly higher scores among men ($M = 56.3$, $SD = 6.5$) than women ($M = 51.3$, $SD = 6.8$), $F(1, 1531) = 158.42$, $p < .001$, $f = .32$, $\omega^2 = .09$. The mean danger invulnerability score was 26.0 ($SD = 8.6$), with significantly higher scores among men 30.7, $SD = 8.7$) than women (24.5, $SD = 8.0$), $F(1, 1523) = 160.11$, $p < .001$, $f = .32$, $\omega^2 = .09$. No ethnic differences were found (controlling for age and gender) in sensation seeking or danger invulnerability. Sensation seeking and danger invulnerability both held significant positive rank-order correlations with all eight of the risk-taking indices (See Table 2).

3.2. Multivariate analysis: danger invulnerability, sensation seeking, and health risk behaviors

Next, we estimated a multivariate Poisson regression model to assess the unique associations of sensation seeking and danger invulnerability to health risk behaviors. We initially estimated models including the sensation seeking X danger invulnerability interaction. In all but one case (hard drug frequency), p values for the interaction term were well out of range of significance (median $p = .38$). Therefore, interaction terms were removed from final analyses. Regression results are presented in Table 3.

Controlling for age and site, sensation seeking and danger invulnerability were both found to make unique contributions to students' health compromising behaviors. Invariance testing indicated full model invariance across gender, delta chi-square (24) = 34.594, $p = .07$, indicating that the model fit equivalently across genders. In regression analyses with both sensation seeking and danger invulnerability as predictors, sensation seeking was associated with participation in six of the eight health compromising behaviors measured (riding with an impaired driver, marijuana use, hard drug use, prescription drug misuse, number of sexual partners during the 30 days prior to assessment, and sex while high/drunk). Sensation seeking was not a significant predictor of driving while intoxicated or engaging in casual sex.

Danger invulnerability was associated with driving while intoxicated, hard drug use, prescription drug misuse, and casual sex in the 30 days prior to assessment, as well as with the number of sexual partners in that time period. Danger invulnerability was not associated with riding with an impaired driver, marijuana use, or sex while drunk/high.

4. Discussion

Sensation seeking and invulnerability are constructs that have often been discussed as potential explanations for adolescent and emerging adult risk behaviors, but that have been seldom examined simultaneously. The few studies that have examined these two predictors together have typically either (a) used measures of sensation seeking where items included references to specific risk behaviors that were also modeled as dependent variables, and/or (b) used instruments where invulnerability was cast as a form of egocentrism. In contrast, the current study used a measure of sensation seeking that does not refer specifically to engagement in risky behaviors and a scale of invulnerability that is specific to attitudes toward dangerous outcomes.

Descriptive findings support concerns that emerging adult college students engage in a high degree of health compromising behavior. For example, over 20% (20.9) of respondents reported driving when they were intoxicated in the 30 days prior to assessment, and over 40% reported riding with an impaired driver during that time. Nearly half (46.6%) of respondents reported engaging in sex while drunk or high within the previous 30 days, and over one third (37.3%) of students reported having more than one sexual partner during that time. These rates of risk behavior engagement reinforce calls for increased attention toward studying and preventing emerging adult risk-taking (Furstenberg, 2006).

Findings demonstrate the utility of danger invulnerability as a predictor of risk behavior among college-attending emerging adults. The issue of perceived invulnerability is somewhat controversial in the adolescent literature. Findings that adolescents sometimes perceive threats as being equally or more likely than adults (Millstein & Halpern-Felsher, 2002), and tend to overestimate certain risks (Fischhoff & Parker, 2000), seem to contraindicate the validity of invulnerability as a cause of the high degree of risk-taking among youth. The current study does not attempt to examine how invulnerability might change with age – in fact, age and danger invulnerability were not correlated within this sample. However, findings do support an assertion that a generalized sense of invulnerability to harmful outcomes is useful in predicting certain health risk behaviors among college-attending emerging adults. Future research might further examine danger invulnerability across other age groups.

Sensation seeking did not predict drinking while drunk/high or casual sex in the regression analyses, a surprising finding considering that such relationships have been found previously (Zuckerman, 2007). Possible explanations include differences in the measure employed, sample characteristics, our use of a Bonferroni-adjusted alpha level, or our use of ZIP models to represent risk-taking behaviors.

Perhaps most importantly, findings help to clarify similarities and distinctions between sensation seeking and danger invulnerability. A moderate (.30) correlation was found between those constructs, and both were found to predict a variety of health compromising behaviors. In fact, rank-order correlations indicated that sensation seeking and danger invulnerability were both significant predictors of all eight risk behaviors included in the study.

At the multivariate level, danger invulnerability predicted engagement in five of the eight risk behaviors measured (driving while intoxicated, hard drug use, prescription drug misuse, casual sex, and number of recent sexual partners). The outcomes that invulnerability did *not* predict (riding with an impaired driver, marijuana use, sex while drunk/high) were those behaviors that ranked as the three most prevalent risk behaviors, all having been reported by at least a quarter of participants (see Table 1). One possible explanation is that danger invulnerability serves as a risk factor primarily vis-à-vis highly norm-breaking (i.e., uncommon among peers) behaviors. Whereas high sensation seeking might lead emerging adults toward behaviors based on how novel or stimulating they are, danger invulnerability might be most influential in cases where the behavior is considered highly dangerous or deviant.

In addition to sensation seeking and danger invulnerability, age was a significant predictor of all eight risk behaviors, with older participants more likely to have engaged in those behaviors in the 30 days prior to assessment. Recently, scholars have recognized that although the risk-taking literature has tended to focus on the teen years, many risky behaviors peak not in adolescence, but during emerging adulthood (Arnett, 2000; Furstenberg, 2006; Park et al., 2006). Within our emerging adult sample, a consistent positive relationship between age and risk-taking remained before and after controlling for danger invulnerability and sensation seeking. Thus, our finding might reflect a combination of environmental restraints, personality, and psychosocial factors. Because older students are less constrained by legal restrictions (e.g., purchasing alcohol), school policies (e.g., living in the dormitory), and parental control – they therefore have increased opportunities for engaging in a number of risk behaviors.

We did not find sufficient evidence to support an interaction, suggesting that danger invulnerability plays a role in risk-taking other than simply facilitating behaviors motivated by high sensation seeking. Within the developmental and environmental context of emerging adulthood and college culture, sensation seeking and danger invulnerability appear to play related but unique roles in risk-taking. Sensation seeking appears to be a general risk factor, and as such may predispose emerging adults toward engaging in various risks to which they are exposed. Danger invulnerability appears to function as a predictor of less common risk behaviors; possibly by downplaying the severity of potential consequences. Future research might explore whether, and why, emerging adults who are high in danger invulnerability might be uniquely inclined toward socially deviant risk behaviors.

5. Limitations and conclusions

We acknowledge several important limitations to the present study. First, the cross-sectional design used cannot directly address developmental change or predict associations over time. Longitudinal data are needed to support our tentative conclusions regarding the relationship between age and risk behavior, as well as our hypothesized directional associations of sensation seeking and perceived invulnerability to risk behaviors in emerging adulthood. Second, we recognize that college students only represent one subset of emerging adults, and therefore findings cannot be expected to generalize to emerging adults who do not attend college. Nonetheless, studying risk behavior among college students is especially relevant given their high engagement in these behaviors, as well as the ready access to these behaviors in the college setting. The low reliability found for the Arnett Sensation Seeking scale ($\alpha = .64$) should be considered an additional study limitation.

Despite these limitations and caveats, the present study has generated valuable information that may help to clarify the roles of sensation seeking and danger invulnerability in health compromising behaviors among emerging adult college students. Findings suggest that sensation seeking and invulnerability should be considered separate, albeit related, processes that help to predict the types of risk-taking behavior often reported by emerging adulthood college students.

Further research might explore the ways in which age, individual dispositions, and psychosocial factors bring high sensation seeking individuals into potentially dangerous situations, whereupon feelings of invulnerability play a role in whether or not they choose to engage in those behaviors. Studies might assess Lapsley's thesis that individuation and separation should predict invulnerability and its associated outcomes.

Finally, future research might consider the positive side of invulnerability and sensation seeking. Lapsley's (2003) discussion of the "two faces" of invulnerability suggests that invulnerability likely has adaptive functions and therefore might be expected to predict some positive (i.e., establishing relationships, expressing creativity) as well as negative outcomes. Likewise, Arnett (1994) notes that sensation seeking need not only predict maladaptive risk-taking, but that it might be manifested in positive outcomes such as leadership or achievement in some contexts, and serving as a strength if directed properly. We hope that the present study will open a line of research examining these and other related issues.

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Percent of male and female participants engaging in risk behaviors at least once in the previous 30 days ($N = 1690$).

Table 1

Behavior	Male (%)	Female (%)	$\chi^2 (1)$	Total (%)	Rank (freq.)
Drove while intoxicated	26.6	19.0	9.94**	20.8	5
Rode with impaired driver	42.2	41.4	0.06	41.6	2
Used marijuana	46.8	39.6	5.93**	41.4	3
Used hard drugs	9.9	9.2	0.15	9.4	8
Misused prescription drugs	13.9	9.2	6.70**	10.4	7
Had at least two sexual partners	39.3	36.7	0.85	37.3	4
Engaged in casual sex	25.5	17.5	11.60***	19.5	6
Engaged in sex while drunk/high	48.1	46.1	0.48	46.6	1

** $p < .01$.

*** $p < .001$.

Table 2

Spearman rank-order correlations between individual characteristics and risk behaviors.

Variable	2	3	4	5	6	7	8	9	10	11	12
<i>Characteristic</i>											
1. Gender	.04	.31 ^{***}	.31 ^{***}	.09 ^{***}	-.03	.08 ^{**}	-.03	.07 ^{**}	.10 ^{***}	-.03	-.03
2. Age	-	-.06 ^{**}	.03	.20 ^{***}	.13 ^{***}	.06 [*]	.08 ^{**}	.05 [*]	.14 ^{***}	.26 ^{***}	.27 ^{***}
3. SS	-	-	.30 ^{***}	.08 ^{**}	.07 ^{**}	.17 ^{***}	.10 ^{***}	.14 ^{***}	.08 ^{**}	.10 ^{***}	.10 ^{***}
4. DI	-	-	-	.17 ^{***}	.09 ^{***}	.11 ^{***}	.08 ^{**}	.13 ^{***}	.12 ^{***}	.05 [*]	.08 ^{**}
<i>Behavior</i>											
5. Driving while intoxicated	-	-	-	-	.38 ^{***}	.30 ^{***}	.26 ^{***}	.28 ^{***}	.29 ^{***}	.27 ^{***}	.36 ^{***}
6. Riding w/impaired driver	-	-	-	-	-	.30 ^{***}	.32 ^{***}	.31 ^{***}	.34 ^{***}	.46 ^{***}	.26 ^{***}
7. Marijuana use	-	-	-	-	-	-	.42 ^{***}	.41 ^{***}	.31 ^{***}	.37 ^{***}	.52 ^{***}
8. Hard drug use	-	-	-	-	-	-	-	.53 ^{***}	.28 ^{***}	.27 ^{***}	.33 ^{***}
9. Prescription drug misuse	-	-	-	-	-	-	-	-	.25 ^{***}	.21 ^{***}	.32 ^{***}
10. Casual sex	-	-	-	-	-	-	-	-	-	.51 ^{***}	.41 ^{***}
11. # Sexual partners	-	-	-	-	-	-	-	-	-	-	.64 ^{***}
12. Sex while drunk/high	-	-	-	-	-	-	-	-	-	-	-

Note: For gender: 1 = female, 2 = male. SS = sensation seeking; DI = danger invulnerability.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3

Risk behaviors by sensation seeking and danger invulnerability.

Outcome	Sensation seeking OR/IRR (95% CI)	Danger invulnerability OR/IRR (95% CI)
<i>Substance use</i>		
Marijuana use ^a	1.40 ** (1.26–1.56)	1.05 (0.99–1.10)
Hard drug use ^b		
Yes/No	2.44 ** (1.42–4.22)	1.38 * (1.08–1.78)
Count	1.24 (0.91–1.68)	0.99 (0.90–1.09)
Prescription drug misuse ^b		
Yes/No	2.77 * (1.60–4.79)	1.59 ** (1.27–2.00)
Count	1.15 (0.83–1.60)	1.03 (0.92–1.16)
<i>Unsafe sexual behavior</i>		
Casual Sex ^b		
Yes/No	1.52 (1.00–2.30)	1.44 ** (1.20–1.73)
Count	1.01 (0.86–1.19)	1.08 (1.00–1.16)
Number of sexual partners (30 days) ^a	1.55 * (1.19–2.03)	1.28 * (1.12–1.46)
Sex while drunk/high ^a	1.26 ** (1.14–1.39)	1.02 (0.97–1.06)
<i>Impaired driving</i>		
Driving while intoxicated ^b		
Yes/No	1.65 (1.10–2.49)	1.69 ** (1.40–2.04)
Count	1.06 (0.88–1.28)	1.03 (0.96–1.11)
Riding with impaired driver ^a	1.16 * (1.05–1.28)	1.05 (1.01–1.10)

Note: Models included sensation seeking, danger invulnerability, age, and collection site. The type 1 error rate was controlled across the 8 regression analyses by Bonferroni Adjustment (0.05/8); the significance level was set at $\alpha = 0.006$.

^aAnalyzed as count variables.

^bAnalyzed using zero-inflated poisson (ZIP) models.

* $p < .0063$.

** $p < .001$.