



Targeting adolescent risk-taking behaviors: the contributions of egocentrism and sensation-seeking*

KATHRYN GREENE, MARINA KRCMAR, LYNDA H. WALTERS,
DONALD L. RUBIN, JEROLD AND L. HALE

Tremendous resources are spent each year developing programs and messages targeting adolescent risk behavior. Adolescents are often reasonably well educated about methods for health promotion such as preventing HIV infection, yet they fail to act accordingly. One widely used individual difference variable, sensation-seeking, has been incorporated in health message design to some extent, but it fails to take development into account. Research on adolescent egocentrism suggests adolescents experience personal fable which can lead to an exaggerated sense of invulnerability. The present study sampled adolescents and college students to examine relative contributions of egocentrism and sensation-seeking to risk-taking behavior. Results indicate a latent factor labeled risk-seeking (primarily indicated by disinhibition and risk-taking personality, and to a lesser degree by invulnerability, experience-seeking, boredom susceptibility, and thrill and adventure-seeking) indeed predicted a latent factor labeled delinquent behavior (primarily indicated by alcohol consumption and delinquency, and to a lesser degree by drug use, drinking and driving, and risky driving). Other results indicate consistently high personal fable combined with high sensation-seeking explained most risk-taking behavior. Implications and directions for future research are discussed.

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Introduction

Adolescents are statistically over-represented in almost every category of risk-taking behavior (Arnett, 1992). Explanations for adolescent risk-taking are much more complex than lack of knowledge or social skills. Most adolescents have the ability to perceive risks accurately yet do not always weigh these risks in their decision-making. Risk-taking behavior in adolescence may be associated with cognitive-social immaturity, but previous health development efforts have largely ignored developmental aspects of adolescent information processing.

One wave of health education programs focused on developing social skills or the context of risk decisions. For example, the popular "Just Say No" program teaches general refusal skills, yet some evidence indicates this program may encourage the opposite of what it intended (e.g. Kim *et al.*, 1989). Similarly, evaluations of DARE programs (drug resistance education for 5th/6th graders) generally show no or limited difference between treatment and control groups (e.g. Wysong *et al.*, 1994), with slight positive results for boys but not girls

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Kathryn Greene is an Associate Professor in the Department of Communication at Rutgers University (4 Huntington St., New Brunswick NJ 08901-1071; E-mail: kgreene@scils.rutgers.edu). Marina Krcmar is an Assistant Professor in the Department of Communication Processes at the University of Connecticut. Lynda Walters is a Professor of Child and Family Development at the University of Georgia. Donald Rubin is a Professor and Jerold Hale is a Professor and Department Head of Speech Communication at the University of Georgia. Please address all correspondence to the first author.

(e.g. DeJong, 1987). Knowledge and social skills may be necessary but not sufficient prerequisites for mature decision-making about risk-taking behavior. Increases in education may fail to reduce risk-taking behavior because knowledge can neither control nor predict behavior.

Health communication researchers have often used individual difference variables to test models and design messages to reduce risk-taking behaviors. For example, a variable called sensation-seeking has received attention, along with a construct called sensation value. Donohew's (1990) critique of public health campaigns includes recommendations to examine information processing and decision-making processes involving cognition and arousal, particularly. However, as an individual difference variable, sensation-seeking is not particularly useful as a message design tool. That is because in any given group there are likely to be both high and low sensation-seekers, making targeting messages difficult. A developmental approach, however, makes it possible to examine both changes by group over time (e.g. age differences) and variation within group (individual differences). A developmental approach and an individual difference approach would lead to markedly different risk avoidance campaigns. To date, a developmental approach has not been used much in health communication (cf., Greene et al., 1995, 1996).

The goal of the present study was to examine the relative contributions of sensation-seeking and a developmental factor called egocentrism to explain risk-taking behavior. Based on this evidence, it will be possible to form recommendations for health message design targeting adolescents. In the following sections, we will first summarize approaches to research on risk-taking. Then we will address, in turn, a developmental approach (adolescent egocentrism) and an individual difference approach (sensation-seeking) Finally, we will discuss and explore possible links between egocentrism and sensation-seeking.

Theories of risk-taking

Risk-taking behavior has been considered a personality characteristic, a learned behavior and a developmental phenomenon. Each of these approaches would lead to different designs of health messages targeting adolescents.

Personality approach. As a personality characteristic or trait, risk-taking is a form of individual difference, and this has dominated communication studies of adolescent risk-taking. Risk-taking behaviors have been associated with traits such as sensation-seeking or self-esteem. Sensation-seeking is broadly defined as a trait identified by the seeking of varied, novel, complex and intense experiences and the willingness to take risks to obtain those experiences (Zuckerman, 1979, 1994). Sensation-seeking in individuals has been found to be associated with behaviors such as alcohol use (Newcomb and McGee, 1989), cocaine abuse (Ball, 1995) and risky sexual behavior (Sheer and Cline, 1994). In this perspective, risk-taking is seen as an individual difference variable, with some individuals having a greater sociobiological need for stimulation than others. Interestingly, sensation-seeking has been found to peak during the adolescent years (Zuckerman, 1994), although no theory-driven developmental explanation for this has been found.

Learned approach As learned phenomena, risk-taking behaviors are considered forms of social deviance that constitute a syndrome of problem behavior (cf., problem behavior theory; Jessor and Jessor, 1977; Donovan and Jessor, 1985). Problem behaviors are seen as outgrowths of poor environmental context, parental background/family structure and parent-child interaction, all of which contribute to family socialization and communication patterns

that are linked to problem behaviors (Gore and Eckenrode, 1994). Expanded to a general social-psychological framework, Jessor (1992) proposed vulnerability to risk is a function of balance within an individual between risk and protection. Risk is conceptualized as: (1) risk of becoming involved in behaviors that are potentially detrimental to health (broadly conceived); and (2) risk of "health and life compromising outcomes" of current and past behaviors (Jessor, 1992, p. 387).

Developmental approach. As a developmental phenomenon, willingness to take risks has been considered both: (1) a normal, developmentally appropriate exploratory behavior, and (2) a negative by-product of cognitive development, specifically of egocentrism. The normal/adaptive perspective places emphasis on risk-taking due to developmental challenges that result in impairment of ability to assess the extent of risk in a given situation. With this perspective, risk-taking is considered deliberative, that is, it is a decision about how to act, weighing risk against other factors. Developmental immaturity or lack of experience may lead to errors in judgment when decisions about risk behavior are made.

The egocentrism perspective, in contrast to the age-appropriate exploratory behavior approach described above, emphasizes a specific type of error in judgment that results from a sense of one's uniqueness or specialness. This sense of uniqueness flows from a cognitive overdifferentiation of self from others, coupled with an underdifferentiation of object of thought. According to accounts of egocentrism, teens focus their attention on their own thoughts, and the assumption is made that others must also be thinking about the same thing (cf., imaginary audience). That the assumption is irrational is not apparent to the adolescent. This quality of irrationality places this conceptualization of risk-taking in the nondeliberative category. Nondeliberative risk-taking is characterized by: (1) lack of awareness of the need to decide about how to act; and (2) failure to recognize risk that is apparent to others (Yates, 1992). This source of risk-taking is not a problem of an error in judgment, rather it may be a lack of recognition that a judgment is needed in a given situation because the adolescent is "blinded" by feelings of invulnerability that accompany feelings of uniqueness. If there is no recognition that a risk judgment is needed in a given situation, then it is easy to understand how adolescents could ignore health messages because they feel the messages are not directed towards them, even when, in fact, they are the target audience. Greene *et al.* (1996, 1998) showed how egocentrism could be used to design health messages and developed message interventions to circumvent the negative effects of egocentrism.

Adolescent egocentrism and effectiveness of health promotion messages

Accounts of egocentrism are most generally located in theories of cognitive development. Adolescents' level of cognitive development is important in determining how adolescents are taught about health issues (Orr and Ingersoll, 1991); that is, it would be considered inappropriate to deliver a highly abstract message to a young adolescent who is still in concrete operations and is not developmentally ready for abstract thought. A developmental perspective has been acknowledged as a valuable way to understand how children process general media messages (Ward *et al.*, 1977; Wartella, 1979), but it has not been thoroughly explored with respect to adolescents or health messages in particular.

Egocentrism is, very generally, an overall focus on self, and it refers to a lack of differentiation in some area of subject-object interaction (Piaget, 1929, 1958). Each of the four Piagetian stages in cognitive development has its own developmental tasks, and the egocentrism which arises at the beginning of the stages is directly related to these tasks.

Elkind (1967, 1978) argued that egocentrism re-emerges at the transitions between each stage of cognitive development. In the course of each cognitive stage, egocentrism decreases as the child gains skill with new cognitive abilities. As the skills associated with a cognitive stage consolidate, the egocentrism associated with transition to that stage is diminished. With consolidation, the child is ready for the next stage and is again captured in a new form of egocentrism (Lapsley *et al.*, 1986). For young adolescents, the egocentrism of interest occurs during the transition from concrete to formal operational thought.

Elkind (1967) proposed the emergence of two expressions of egocentrism in this transition from concrete to formal operations in adolescence: (1) imaginary audience, where an inability to differentiate the object of thought leads to thinking that others are preoccupied with you because you are preoccupied with yourself; and (2) personal fable, where new ability to think about thoughts leads to a fascination with one's own thoughts which are surely different from the thoughts of others, and thus a belief in one's uniqueness and invulnerability.

Adolescents have been found to be highest in both imaginary audience and personal fable in 8th/9th grade, with a steady decline with age and consolidation of formal operations. Additionally, there are relatively consistent gender differences in egocentrism, with girls scoring higher on imaginary audience measures (e.g. Elkind and Bowen, 1979; Gray and Hudson, 1984; Walters *et al.*, 1991; Greene *et al.*, 1996) and boys scoring higher on personal fable measures (e.g. Lapsley *et al.*, 1989; FitzGerald, 1991; Greene *et al.*, 1996). These findings reaffirm the significance of separate messages for boys and girls and by age.

Several researchers have noted the relevance of egocentrism in examining adolescent risk behavior (e.g. Melton, 1988; Cantania *et al.*, 1989). Goldsmith *et al.* (1972) asked girls to rate reasons why a girl might not use contraceptives, and the personal fable explanation "I'd feel like pregnancy would never happen to me" tied for most frequent. Gershenson and Handler (1985) asked inner city girls to rate risks for themselves and for friends' behavior in response to sexual pressure, and participants maintained that what happens to others will not happen to them (possible pregnancy in this case). Gerrard *et al.* (1983) reported girls with perceptions of low probability of becoming pregnant were more likely to fail to use contraceptives or to use them unreliably. Finally, Kalmuss (1986) reported girls' perceptions of their probability of becoming pregnant was the best predictor of their contraceptive use. Thus, there is evidence that adolescents may believe themselves to be immune from consequences that might result (for others) from risk behavior (Arnett, 1990b).

Recent studies (Greene *et al.*, 1995, 1996) were the first to empirically link measured components of adolescent egocentrism to adolescents' responses to AIDS messages. In these studies, informed by the theory of reasoned action (Ajzen and Fishbein, 1974), adolescents' intentions to comply with a message regarding safer sex practices were mediated by personal fable. Specifically, the uniqueness component of personal fable was a strong predictor of attitudes toward risk behavior, and imaginary audience was a strong predictor of subjective norm. The message variable in this study, language explicitness, was found to have an effect on the relation between attitude and personal fable. Specifically, under the condition of an explicit message, the inverse relation between personal fable and attitudes towards avoiding risk behavior was greatest. Later work by Greene and colleagues (1998) explored related message features and found messages which encouraged deep elaboration were partially effective in changing adolescents' intentions to behave in ways to reduce risks. Interestingly, the message type interacted with sensation-seeking and cognitive development to explain behavioral intentions and message perceptions. These studies provide important evidence for

the utility of the egocentrism construct in understanding adolescent risk behavior and how to best design risk intervention messages.

The results of Greene *et al.*'s studies (1995, 1996) indicate that egocentrism, both imaginary audience and personal fable, can be useful in predicting adolescents' intentions to behave in ways that would reduce their risk behavior. Personal fable, especially invulnerability, is negatively associated with adolescents' perceived susceptibility, intention to avoid risk behaviors, and subjective norm. Imaginary audience may, however, also have a constructive effect on behavior. That is, high imaginary audience is associated with increased inclination to comply with others, which may positively affect behavior, perhaps making adolescents more cautious. As such, imaginary audience might be a "helpful" form of egocentric distortion. However, those who are involved in groups where the peer norm promotes rather than discourages risky behavior may be at substantially greater risk. For example, girls who live in a culture where young adolescents routinely become pregnant and give birth understand that sexual activity is expected and early pregnancy is normal. If their mentally constructed audience is consistent with what they see and hear in their immediate environment, we should expect that they may perceive exaggerated pressure from peers to be sexually active and possibly to bear children.

One of the particular values of Greene *et al.*'s studies (1995, 1996) is that they propose a developmental component to explain risk behavior, rather than relying strictly on an individual difference component. What is markedly different about egocentrism is that it provides specific recommendations for message design by developmental group because it provides information about how adolescents think or reason about health risks. In contrast, individual difference variables cannot, by the very nature of individual difference, inform messages directed at entire groups or subgroups. Previously, message design has incorporated a chronological variable (age). Although age may serve as a proxy for development, it does not explain what is occurring in terms of development and therefore provides no specific information about how to best construct and deliver prevention messages targeted at adolescents of various ages.

Sensation-seeking and effectiveness of health promotion messages

Sensation-seeking as a variable has been used in previous health communication research (see Donohew *et al.*, 1980, 1991, 1994; Sheer and Cline, 1994; Sheer, 1995). Sensation-seeking as a personality trait was originally examined by Zuckerman (1979) and purportedly measures an individual's "need for varied, novel and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experiences" (p. 11). The instrument is comprised of four subscales: adventure-seeking, experience-seeking, disinhibition and boredom susceptibility.

One area of research on sensation-seeking has attempted to identify both physiological and biological links to sensation-seeking. For example, Graham (1979) found that high sensation-seekers, as compared to low sensation-seekers, exhibit a stronger orienting response (as measured by heart rate) to novel stimuli but habituate more quickly. Similarly, Robinson and Zahn (1983) found that high sensation-seekers exhibit greater electrodermal reactivity to novel stimuli, and Hauri and Olmstead (1989) found that high sensation-seekers who were also insomniacs showed greater cortical arousal than their low sensation-seeking counterparts during a study of sleep patterns. Based on these physiological results, it appears that high sensation-seekers react more strongly to novel stimuli. However, other physiological measures have indicated no difference between high and low sensation-seekers.

For example, there is no relationship between sensation-seeking and EEG (Golding and Richards, 1985), skin conductance (Zuckerman, 1990) or cardiac arousal (Robinson and Zahn, 1983). These latter variables are frequently cited indices of general arousability, and one would expect them to be associated with sensation-seeking as defined by Zuckerman. Therefore, it is unclear from a physiological perspective whether there are differences in responses due to sensation-seeking.

Sensation-seeking has been associated with a variety of behavioral factors, including cocaine use (e.g. Ball, 1995), lax attitudes about the risk of contracting HIV (Lasora and Shoemaker, 1988), risky sexual behaviors among college students (Arnett, 1991), risky driving behaviors (Zuckerman and Neeb, 1980) and alcohol use among adolescents (Newcomb and McGee, 1989). For example, Donohew *et al.*, (1994) have found adolescent high sensation-seekers are two to seven times more likely to report alcohol use compared with low sensation-seekers. Gillis *et al.* (1992) found sensation-seeking explained an additional 7 per cent variance in risky sexual behavior. As a result of these findings, many researchers have concluded that sensation-seeking as a construct is both distinct from and related to risk-taking.

However, not all of the results linking sensation-seeking and risk-taking are thoroughly convincing. For example, Sheer and Cline (1994) found sensation-seeking directly predicts the number of sexual partners an individual has had and indirectly predicts occurrence of unprotected sex among college students. Both of these behaviors have been found to relate to higher incidence of HIV and uterine cancer and therefore might accurately be called "risky behaviors". However, it is worth noting that in this particular study Sheer and Cline actually used a measure of risk-taking (Ferguson and Valenti, 1990) and refer to it as sensation-seeking, thus resulting in the claim that sensation-seeking leads to risk behaviors. Because they did not use a measure of sensation-seeking (e.g. Zuckerman, 1979) but an established risk-taking scale, instead, the only claim that can accurately be supported by those data is the notion that risk-taking predisposition predicts risk behaviors. This finding, although difficult to question, does not inform us about sensation-seeking. Therefore, more research must be examined before it can be confidently concluded that sensation-seeking predicts risky behaviors.

Donohew and colleagues were the first to test the utility of sensation-seeking in predicting message effects. High sensation-seekers (HSS) have lower arousal levels and require stronger, exciting and novel messages for attracting and holding attention, while low sensation-seekers (LSS) have higher arousal levels and avoid stimuli (Donohew *et al.*, 1980; Donohew *et al.*, 1991). Based on these findings, they investigated a message variable called sensation value, defined by a message's ability to elicit sensory, affective and arousal responses. Messages with high sensation value are more effective for high sensation-seekers, and sensation value affects attention (Palmgreen *et al.*, 1991). Palmgreen, however, noted the interactive relation between sensation value and sensation-seeking. Sheer (1995) also examined sensation-seeking and message appeals, and she reported HSS and males prefer pleasure appeals for condom use, but females in general prefer caring and responsibility appeals.

Gender and sensation-seeking. The relation between sensation-seeking and risk-taking has not been found to be the same for all subsamples of a given population. Overall, males tend to exhibit higher levels of sensation-seeking than females, particularly on the Thrill and Adventure-seeking and Disinhibition subscales (Zuckerman, 1994). Although several sociological explanations for these sex differences have been offered (e.g. Eysenck and Haapasalo, 1989), Zuckerman (1994) suggests that sex differences in sensation-seeking

"could be due to differences in gonadal hormones. Gonadal hormones in males are related to sensation-seeking, particularly Disinhibition, and testosterone is related to masculinity [on the Bem scale]" (p. 377). Therefore, both sociological and biological explanations for sex differences have been offered.

Males also tend to engage in more risky behaviors than their female counterparts. For example, Newcomb and McGee (1989) found that although sensation-seeking was a significant predictor of deviance in adolescence for boys and girls, different subscales related to different deviant acts for the sexes. Similarly, Donohew (1988) found that among high sensation-seeking adolescents, males were consistently more likely than females to use a variety of drugs ranging from alcohol to cocaine.

Critiques of sensation-seeking. Overall, the phenomenon of sensation-seeking has enjoyed vigorous investigation and a compelling body of findings. However, the construct of sensation-seeking is not without flaws. When the body of results are considered, the consensus is clear: sensation-seeking predicts risky behaviors. But as Sheer and Cline (1994) themselves contend: "because the predisposition for risk-taking results from a preference for arousing stimuli, risk-taking is synonymous with sensation-seeking" (p. 282). Many high sensation value stimuli are, in fact, high risk. If this is indeed the case, then caution must be undertaken. Does sensation-seeking as a construct predict risk-taking, or are the two so similar as to defy the definition of separate constructs? For example, Arnett and Balle-Jensen (1993) stated:

It should be noted that certain items on the sensation-seeking measures (e.g. "I like to have new and exciting experiences and sensations, even if they are little frightening, unconventional or illegal") may be considered too close to risk behavior to be actually measuring a separate construct (p. 1851).

Therefore, one major critique of sensation-seeking is its conceptual and operational overlap with risk-taking. Rather than sensation-seeking as a psychological construct predicting risk-taking as a behavior, the two may actually be closely related constructs measuring both attitude and behavior simultaneously.

A second critique of sensation-seeking is its link to adolescent development. In general, sensation-seeking has been found to appear in adolescents at or around the age of 11, show a noticeable increase from grades 7 through 9 (Donohew *et al.*, 1994) and continue to increase during adolescence (Arnett and Balle-Jensen, 1993). Individual differences in scores would be expected, but there are also differences between age groups. Scores on sensation-seeking then decline steadily with age, from 16 on (Zuckerman *et al.*, 1978). In fact, Arnett (1990a, b) found that risky behaviors such as unsafe sex and alcohol use follow a developmental trajectory very similar to that of sensation-seeking. Zuckerman (1994) himself claims that:

most people believe that the restraint that comes with age is a matter of increments in wisdom, but other data suggest that it may have something to do with the age changes in our biology (p. 99).

For example, in males, there is a significant rise in testosterone during adolescence. The pattern of the quantity of testosterone in young males is similar to the pattern of sensation-seeking. As a result, claims Zuckerman, increased testosterone leads to increased arousal and

the subsequent noted increase in sensation-seeking. This line of reasoning, too, bears further investigation regarding developmental changes in purportedly individual difference phenomena.

Relation between egocentrism and sensation-seeking

The problem with sensation-seeking and its relation to risk-taking may well be addressed and informed by theories of adolescent development. For example, the content of some items measuring sensation-seeking (Form V of SSS, Zuckerman, 1994) and risk-taking are similar to items on personal fable scales derived from conceptualization of adolescent egocentrism (Lapsley's NPFS, 1991). Sensation-seeking and risk-taking are different from egocentrism, however, because the former do not increase across all adolescents and diminish as adolescents mature, whereas the pattern for egocentrism indicates changes linked specifically to development. The cognitive egocentrism variables explored here, if anything, have more profound explanatory power than the attentional preferences and sensation-seeking that have been the focus of some health message research, particularly that geared toward adolescents. The cognitive developmental processes may actually underlie and drive the stimulus-seeking behaviors.

Few studies to date, however, have proposed that egocentrism may actually be responsible for increased sensation-seeking and risk-taking in adolescence. Arnett (1990a, b) measured sensation-seeking using Zuckerman's SSS (Form V) but only measured probability items (and labeled this egocentrism). Interestingly, both probability and sensation-seeking explained differences in contraceptive use (with similar patterns); however, correlations showed probability and sensation-seeking to be unrelated (Arnett, 1990a). Melton (1988) suggested using both egocentrism and sensation-seeking to explain risk-taking behavior but provided no data on relative contributions of each.

The primary goal of this project was to test how a component of adolescent development, egocentrism, would explain risk-taking behaviors. The present study proposes that, for adolescents, the interaction between sensation-seeking and personal fable provide the best explanation of risk-taking behaviors. Based on the preceding rationale, the following hypotheses are proposed:

H1: A linear combination of sensation-seeking (experience-seeking, thrill and adventure-seeking, disinhibition and boredom susceptibility), personal fable (omnipotence, invulnerability and uniqueness) and risk-taking personality will correlate significantly with a linear combination of risk-taking behaviors (smoking, risky sexual behavior, drug use, risky driving, delinquency, alcohol consumption, and drinking and driving).

H2: Sensation-seeking and personal fable will affect risk-taking behaviors, such that the highest risk-taking behaviors will be reported for participants high in both sensation-seeking and personal fable and the lowest risk-taking behaviors will be reported for participants low in both sensation-seeking and personal fable.

Method

Participants and procedure

To enable cross-sectional comparisons across adolescence, junior high school and high school students ($n = 381$) and college students ($n = 343$) were sampled. The junior and high school students ranged in age from 11 to 18 ($M = 15.1$; $S.D. = 1.7$), and college from 18 to 25

($M = 20.74$; $S.D. = 1.6$). Participants who were younger than 11 or older than 25 were not included in the present study. The sample included 414 women (57%) and 303 men (42%) (7 or 1% did not report gender). Participants were largely (82%) Caucasian, and the sample reported mothers' education averaged just above "some college education" and fathers' education averaged slightly below "college degree".

College students were recruited from introductory communication courses at a south-eastern university. College students completed the survey outside of class time and received credit for their participation. Fifty participants were also recruited from communication classes at a second large southeastern university. There were no differences between students at the two universities, so they were combined for subsequent analyses.

Junior high and high school students were recruited by students trained in a research methods course who selected adolescents aged 11–18.[†] Participants received a survey with a set of instructions and filled out the survey in their homes. Parental consent was required prior to participation. The questionnaire took approximately 45 minutes to complete and was anonymous (participants sealed it in an envelope separate from the consent form to increase their confidence in anonymity). After completing the questionnaire, participants were debriefed and thanked for their participation. Random callbacks (20% contact) by a research assistant occurred two weeks later to ensure participants had filled out the survey.

Two versions of the survey were developed, to examine possible order effects for the personal fable and sensation-seeking measures. There were no significant differences between the versions, so they were combined for subsequent analyses. The survey is part of a larger project examining adolescent risk-taking and health messages. Participants first filled out measures of imaginary audience, personal fable, sensation-seeking, risk-taking personality and cognitive development. Participants then returned part 1 to the researcher (or sealed it in an envelope). Part 2 consisted of measures of risk-taking behavior and behavioral intention.

Measurement instruments

Variables measured included the following: personal fable, sensation-seeking, risk-taking personality, risk-taking behavior and demographics.

Personal fable. The personal fable scale used in the present research was developed by Lapsley (1991). It yields three subscales (omnipotence, uniqueness and invulnerability). Although there is some reliability information available for the NPFS, validity information presented by Lapsley and his colleagues, to this point, is limited. Cole (1991) has reported general negative correlations between NPFS and measures of depression ($r = -0.32$ to -0.41) and parasuicidal ideation ($r = -0.24$). Greene *et al.*, (1995, 1996) also used the NPFS in a study of AIDS messages and found moderate negative correlations between the uniqueness subscale and attitude towards avoiding risk behavior, subjective norm and behavioral intention. The reliabilities in the present study were uniqueness = 0.61, invulnerability = 0.74, omnipotence = 0.80. The items were summed and averaged to form three composite scales with higher scores indicating more personal fable characteristics.

[†]The sample plan was convenience, but there were target groups each researcher had to contact. Each researcher was required to sample equal numbers of girls and boys. In addition, each data gatherer had to pass a mock interview (observed by the first author) before s/he was allowed to collect data.

Sensation-seeking. Sensation-seeking was measured by Form V of Zuckerman's (1994) sensation-seeking scale (SSS). Zuckerman has reported extensive psychometric information about this measure, and it has been widely used in studies of risk-taking behavior. The measure consists of 40 forced choice items. A composite scale is created by summing items, with higher scores indicating greater need for stimulation or greater "sensation-seeking". The scale is made up of four subscales: experience-seeking (ES), thrill and adventure-seeking (TAS), disinhibition (DIS) and boredom susceptibility (BS). Each of these test an individual's tendency to approach, rather than avoid, novel stimuli. Although the measure is strictly self-report, the theoretical basis is biological, with higher sensation-seekers having higher optimum levels of physiological arousal. Sensation-seeking has been found to correlate consistently with physiological arousal measures (Zuckerman, 1994). Reliabilities (KR 20s) for the subscales in the present study were: TAS = 0.82; ES = 0.62; DIS = 0.83; BS = 0.61. The items were summed to form four composite scales, with higher scores indicating more sensation-seeking.

Risk-taking personality. A measure of risk-taking personality is included to help establish the construct validity of the personal fable and sensation-seeking measures. The risk-taking personality items were selected from Ferguson and Valenti (1991). The full scale contains 25 six-point Likert-type items with responses ranging from "Very Unlike Me" to "Very Like Me". Fourteen items were selected for the present study based on factor loadings reported for each of the three subscales, for example, "I'm an adventurous person" and "I enjoy the company of real partiers". The reliability in the present study was 0.80. Items were summed and averaged to form a composite scale, with higher score indicating more risk-taking personality traits.

Risk-taking behavior measures

Seven kinds of risk-taking behavior were measured including smoking, risky sexual behavior, drug use, risky driving, delinquency, alcohol consumption, and drinking and driving.

Smoking. Smoking was measured by two items developed by the authors. The first item asked "How many cigarettes do you smoke a day?", and the five responses ranged from "none" to "a pack or more". The second item asked "How long have you been smoking at your current level?" The response was number of years, coded zero for non-smokers. These two items were summed to form a smoking score ($M = 2.59$; $s.d. = 3.08$; range 1–22), with a higher score indicating more smoking for a longer period.

Risky sexual behavior. Risky sexual behavior was measured by three items developed by the authors. The first two items asked "How many different sexual partners have you had in the past 2 years/6 months?", and the number was entered (those not sexually active were scored 0). The next item asked "How often do you (does your partner) use a condom when you have sexual intercourse?" The five-point Likert-type responses ranged from "always" (1) to "never" (5). These items were summed to form a risky sex score ($M = 4.74$; $s.d. = 6.34$; range 0–46), with a higher score indicating more past sexual partners and less protective behavior.

Drug use. Illegal drug use was measured by seven items developed by the authors. The prompt asked "In the past 90 days, how many times have you used each of the following?" The target drugs included marijuana, uppers, downers, LSD, tranquillizers, opiates and cocaine/crack. The six-point Likert-type responses ranged from "never" (1) to "more than

10" (6). These items were summed and averaged to form a drug use score ($M = 1.31$; $S.D. = 0.53$; range 1–5.86), with a higher score indicating more past drug use. The reliability was moderate ($\alpha = 0.71$) but increased when the marijuana item was deleted ($\alpha = 0.80$).

Risky driving behavior. Risky driving was measured by three Likert-type items developed by the authors. The items included: "How often have you driven over 80 mph?", "How often have you driven more than 20 mph over the speed limit?" and "How often have you passed in a no passing zone while driving?" The responses ranged from "never" (1) to "very often" (5). These items were summed and averaged to form a risky driving score ($M = 2.16$; $S.D. = 1.04$; range 1–5), with a higher score indicating more risky driving. The reliability was good ($\alpha = 0.92$).

Delinquent behavior. Delinquent behavior was measured by six Likert-type items developed by the authors. The items included: "How often have you cheated on a test in school?", "How often have you shoplifted from a store?", "How often have you trespassed on restricted property?", "How many times have you participated in vandalism (damage to or destruction of property)?", "How often do you gamble?" and "How often have you gambled more than \$25 on an event?" The responses ranged from "never" (1) to "very often" (5). These items were summed and averaged to form a delinquency score ($M = 1.74$; $S.D. = 0.61$; range 1–5), with a higher score indicating more delinquent behavior. The reliability was moderate ($\alpha = 0.79$).

Alcohol consumption. Alcohol consumption was measured by three Likert-type items developed by the authors. The items included: "How often do you drink alcoholic beverages?", "How often do you become drunk?" and "On a typical occasion, how much alcohol do you consume?" The responses for the first two items ranged from "never" (1) to "every day" (5), and responses for the quantity item ranged from "less than one drink" to "6 or more drinks". These items were summed and averaged to form a drinking score ($M = 2.27$; $S.D. = 1.24$; range 1–4.67), with a higher score indicating more alcohol consumption. The reliability was good ($\alpha = 0.90$).

Drinking and driving. Drinking and driving was measured by two Likert-type items developed by the authors. The items included: "In the past year, how often have you driven a car while under the influence of alcohol?" and "In the past year, how often have you ridden with a driver who was under the influence of alcohol?" The responses ranged from "never" (1) to "6 or more times" (5). These items were summed and averaged to form a drinking and driving score ($M = 1.97$; $S.D. = 1.24$; range 1–5), with a higher score indicating more drinking and driving. The reliability was adequate ($\alpha = 0.83$).

Results

Analyses

Analyses of variance (ANOVAs), *t*-test, a canonical correlation and stepwise multiple regressions were used to analyze data. A zero-order correlation matrix is presented in Table 1. Reliabilities were estimated by Cronbach's alphas and KR 20's. The a priori level of significance was set at $p \leq 0.05$.

Demographic findings

Initial univariate analyses explored potential differences in all variables by age, SES and sex. Analyses were performed for all sensation-seeking, egocentrism, risk-taking personality and risk-taking behavior measures.

Age. Correlations between age and other variables measured are reported in Table 1. As expected, there were significant findings, especially for the risk-taking behavior items. The correlations were moderate in size and generally positive, with the largest including driving, risky sex and drinking. The results for the predictor variables were largely not significant, as might be expected given the nature of sensation-seeking as a variable and the fact that the relation for egocentrism would likely be expected to be curvilinear in the present sample.

SES. Two variables were included to approximate SES, though the single-item measures have significant limitations. The first item stated "Was there a set of encyclopedias in the home where you grew up?" For the following variables, *t*-tests indicated no differences on the encyclopedia item: sensation-seeking TAS, ES and BS, all three personal fable subscales, risky sex and smoking. There were, however, significant differences by encyclopedia presence for the following variables: sensation-seeking DIS ($p < 0.001$), risk-taking personality ($p < 0.01$), drinking ($p < 0.01$), drinking and driving ($p < 0.05$), delinquency ($p < 0.05$) and drug use ($p < 0.01$). In every single case, those who grew up with encyclopedias in the home scored significantly lower on the variable. The encyclopedia item consistently explained differences in risk-taking behaviors. These differences were largely on the univariate level, as follow-up analyses did not indicate interactions with other variables.

Two other variables were combined to explore these results, and items asked about the highest level of education completed by the participant's mother and father. These items were summed and averaged to form a parents' education score, and the correlations are presented in Table 1. The higher the parents' education, the higher the child's sensation-seeking TAS, invulnerability and drinking. For risky sex, however, the relation was inverse, with higher parents' education associated with less risky sex. Results indicate the associations are relatively small in size, none greater than 0.12, and should be interpreted with caution. It is interesting to note the lack of consistent findings, as some might argue that more parental education is associated with lower risk-taking by the child, largely not the case in these data.

Sex. Findings of sex differences were the most consistent in the study. The *t*-tests indicated that there were significant differences by sex on every variable (at the 0.01 or 0.001 level) in this study with the exception of one (uniqueness, which could easily be explained by error), and in every single case boys scored higher. Thus, males reported more sensation-seeking, egocentrism, risk-taking personality and risk-taking behavior compared with females. Further explorations of these sex differences indicated they were best explained on the univariate level. For Hypothesis 1, canonical correlations by sex indicated the same significant roots with the same significant variables (only differences in the strength of the loadings, but not the order of loadings). For Hypothesis 2 there was not a single significant interaction effect with sex. Thus, for simplicity, results are described collapsed with both sexes. The consistency of the univariate findings, however, lends support to repeated efforts to target risk-taking in males.

Hypothesis 1

The first Hypothesis proposed there would be a significant linear combination of sensation-seeking (4 subscales), personal fable (3 subscales) and risk-taking personality with a

Table 1 Correlation matrix for all variables

	SS BS	SS DIS	SS ES	SS TAS	PF Invol.	PF Omnip.	PF Uniq.	Risk Psy	Risk Smoke	Risk Sex	Drug Use	Driving	Delinq	Alcohol	Drink/Drive	Age	Prt. Edn.
SS BS	1.00																
SS DIS	0.53**	1.00															
SS ES	0.29**	0.46**	1.00														
SS TAS	0.26**	0.38**	0.41**	1.00													
PF Invol.	0.41**	0.42**	0.27**	0.51**	1.00												
PF Omnip.	0.26**	0.24**	0.11*	0.20**	0.54**	1.00											
PF Uniq.	0.11**	0.07	0.18**	-0.01	0.11*	0.18**	1.00										
Risk Psy	0.48**	0.66**	0.39**	0.53**	0.54**	0.25**	0.08	1.00									
Smoke	0.12*	0.32**	0.26**	0.18**	0.12*	0.02	-0.02	0.25**	1.00								
Risk Sex	0.11*	0.25**	0.18**	0.06	0.06	0.11**	0.09	0.16**	0.10*	1.00							
Drug Use	0.34**	0.49**	0.42**	0.24**	0.26**	0.14**	0.12*	0.41**	0.36**	0.23**	1.00						
Driving	0.24**	0.48**	0.32**	0.30**	0.20**	0.19**	0.06	0.38**	0.25**	0.28**	0.38**	1.00					
Delinq	0.38**	0.57**	0.32**	0.27**	0.42**	0.25**	0.16**	0.48**	0.19**	0.16**	0.51**	0.45**	1.00				
Alcohol	0.35**	0.69**	0.36**	0.34**	0.28**	0.18**	0.03	0.57**	0.33**	0.29**	0.55**	0.56**	0.47**	1.00			
Drink/Drive	0.25**	0.48**	0.30**	0.17**	0.13**	0.11*	0.06	0.34**	0.24**	0.24**	0.46**	0.51**	0.38**	0.69**	1.00		
Age	0.05	0.19**	0.18**	0.06	-0.03	0.07	-0.04	0.06	0.15**	0.35**	0.21**	0.44**	0.08	0.42**	0.33**	1.00	
Prt. Edn.	0.01	0.04	0.06	0.12*	0.11**	0.8*	0.09	0.01	0.01*	-0.10*	-0.04*	-0.03	-0.05	0.10*	-0.08	-0.03	1.00

**p < 0.001; *p < 0.01.

Variable names in order: Sensation-seeking (boredom susceptibility-BS, distillation-DIS, experience-seeking ES and thrill and adventure seeking-TAS), personal fable (invulnerability, omnipotence and uniqueness), risk-taking personality, smoking, risky sexual behavior, drug use, risky driving, delinquency, alcohol use, drinking and driving, age and parents' education.

combination of smoking, risky sexual behavior, drug use, risky driving, delinquency, alcohol consumption, and drinking and driving. This hypothesis was supported. Initially, correlations among the predictor variables (sensation-seeking, egocentrism and risk-taking) and the risk-taking behaviors were examined. The correlations show interrelation among the independent and dependent variables. A canonical correlation was calculated to investigate the relation between the set of eight predictor variables and seven outcome variables. The canonical correlation was significant ($F(56) = 11.16; p < 0.001$). The first three functions were significant. The first canonical root yielded a canonical correlation of 0.78 ($F(56, 2617) = 11.2; p < 0.001$) with an eigenvalue of 1.5, capturing 85 per cent of the standardized variance in the risk-taking behavior variables. The second root yielded a canonical correlation of 0.30 ($F(42, 2282) = 2.8; p < 0.001$) with an eigenvalue of 0.11, capturing 6 per cent of the standardized variance in the risk-taking behavior variables. The third root yielded a canonical correlation of 0.27 ($F(30, 1950) = 2.3; p < 0.001$) with an eigenvalue of 0.08, capturing 4 per cent of the standardized variance in the risk-taking behavior variables. Because of the small canonical correlations and low standardized variance of the second and third roots, only the first was interpreted. Table 2 contains the standardized and structure coefficients for the dependent variables and covariates for the first function.

The correlations for the independent variables and the canonical variate indicate that sensation-seeking disinhibition (-0.97) and risk-taking personality (-0.80), and to a lesser degree experience-seeking (-0.56), boredom susceptibility (-0.54), thrill and adventure-seeking (-0.47) and invulnerability (-0.49), loaded highest on function 1. This latent factor was labeled risk-seeking.

The correlations for the dependent variables and the canonical variate indicate that alcohol consumption (-0.91) and delinquency (-0.77), and to a lesser extent drug use (-0.68), drinking and driving (-0.63) and risky driving (-0.65), loaded highest on function 1. This latent factor was labeled delinquent behavior. Smoking and risky sexual behavior did not load significantly, thus they were considered to be of a different kind of risk-taking quality.[‡]

Hypothesis 2

Hypothesis 2 predicted an interaction between personal fable and sensation-seeking to explain risk-taking behavior. To conduct this analysis, a median split for the total sensation-seeking variable (created by summing the 4 subscales) was performed, creating a high and low sensation-seeking group. This procedure was repeated for the total personal fable variable (the 3 scales summed and averaged), creating a high and low personal fable group. The initial MANOVA, with independent variables sensation-seeking (high/low) and

[‡]Risky sex (and marginally smoking) did not load on any canonical variate. As a follow-up to explore these two variables, two regressions were run predicting first risky sex and then smoking. The same eight predictor variables were entered using stepwise method.

The model predicting smoking revealed two variables explained smoking behavior. On step 1, disinhibition ($\beta = 0.33; p < 0.01$) entered ($F(1,554) = 66.8; p < 0.001; \text{Adj. } R^2 = 11\%$). On the second step, experience-seeking ($\beta = 0.16; p < 0.05$) entered, accounting for an additional 2% of the variance. Specifically, people higher in disinhibition and experience-seeking smoked more and longer.

The model predicting risky sex revealed two variables predicted risky sexual behavior. On step 1, disinhibition ($\beta = 0.27; p < 0.01$) entered ($F(1,550) = 42.3; p < 0.001; \text{Adj. } R^2 = 7\%$). On the second step, uniqueness ($\beta = 0.09; p < 0.05$) entered, accounting for an additional 2 per cent of the variance. Specifically, people higher in disinhibition and uniqueness reported more risky sexual behavior.

Table 2 Standardized and structure coefficients for canonical results for function 1

	Standardized	Structure
<i>Dependent Variables</i>		
Smoking	-0.09	-0.43
Risky Sex	-0.05	-0.33
Drug Use	-0.09	-0.68
Driving	-0.09	-0.65
Delinquency	-0.39	-0.77
Alcohol	-0.64	-0.91
Drink/Drive	0.08	-0.62
<i>Independent Variables</i>		
SS TAS	-0.02	-0.47
SS ES	-0.10	-0.56
SS DIS	-0.75	-0.97
SS BS	0.03	-0.54
PF UNIQ	-0.03	-0.14
PF INVUL	0.03	-0.49
PF OMNIP	-0.06	-0.31
RISK PSTY	-0.26	-0.80

personal fable (high/low) predicting the seven risk-taking behavior variables, was significant ($F(7, 517) = 2.26$; $p < 0.03$; Wilks = 0.97). The follow-up series of ANOVAS predicted each of the seven risk-taking behaviors in turn. The results are summarized in Tables 3 and 4 and are now expanded further.

Alcohol consumption. There was a significant interaction effect between sensation-seeking and personal fable. The highest alcohol consumption was reported for participants high in both sensation-seeking and personal fable. The lowest alcohol consumption was reported by participants low in sensation-seeking with either low personal fable or high personal fable. Moderate alcohol consumption was reported by participants low in personal fable but high in sensation-seeking.

Drinking and driving. There was no significant interaction effect for sensation-seeking and personal fable. There was a significant main effect for sensation-seeking, with participants higher in sensation-seeking ($M = 2.40$) reporting more drinking and driving than those low in sensation-seeking ($M = 1.57$).

Risky sexual behavior. There was a significant interaction effect between sensation-seeking and personal fable. Highest levels of risky sexual behavior were reported for participants high in both sensation-seeking and personal fable. The lowest risky sexual behavior was reported by participants low in sensation-seeking with either low personal fable or high personal fable. Moderate risky sexual behavior was reported by participants low in personal fable but high in sensation-seeking.

Smoking. There was no significant interaction effect for sensation-seeking and personal fable. There was a significant main effect for sensation-seeking, with participants higher in sensation-seeking ($M = 3.42$) reporting more smoking than those low in sensation-seeking ($M = 1.84$).

Table 3 Summary of results for test of interaction hypothesis

Behavior		Sensation-seeking		Interaction PF × SS
		Low Mean (n)	High Mean (n)	
Smoking				n.s.
Pers. fable	Low	1.91 (172)	3.39 (112) ^a	
	High	1.71 (78)	3.38 (176)	
Risky sex				**
Pers. fable	Low	3.76 (172)	5.23 (112)	
	High	2.77 (78)	7.32 (176)	
Drug use				*
Pers. fable	Low	1.10 (185)	1.42 (114)	
	High	1.11 (88)	1.60 (173)	
Driving				n.s.
Pers. fable	Low	1.79 (185)	2.50 (114) ^a	
	High	1.77 (88)	2.66 (173)	
Delinquency				**
Pers. fable	Low	1.45 (185)	1.76 (114)	
	High	1.53 (88)	2.09 (173)	
Alcohol				**
Pers. fable	Low	1.74 (172)	2.67 (112)	
	High	1.63 (78)	2.96 (176)	
Drink/Drive				n.s.
Pers. fable	Low	1.58 (172)	2.31 (112) ^a	
	High	1.52 (78)	2.49 (176)	

^a main effect for sensation-seeking ($p < 0.001$).

** $p < 0.001$; * $p < 0.05$.

Table 4 Summary of ANOVAS for risky behavior variables

	Pers. fable effect	Sen. seek effect	PF × SS Interaction	Error
Smoking	MS = 4.01 F = 0.43	MS = 332.3 F = 35.3***	MS = 0.11 F = 0.01	9.41
Risky sex	MS = 78.9 F = 1.92	MS = 991.4 F = 24.12***	MS = 305.5 F = 7.45**	41.1
Drug use	MS = 1.75 F = 5.97**	MS = 20.22 F = 104.1***	MS = 0.83 F = 4.28*	0.19
Driving	MS = 0.42 F = 0.50	MS = 82.2 F = 97.5***	MS = 0.72 F = 0.86	37.5
Delinquency	MS = 5.38 F = 21.08***	MS = 22.83 F = 89.4***	MS = 2.07 F = 8.11**	52.2
Alcohol	MS = 1.58 F = 1.74	MS = 151.2 F = 166.1***	MS = 5.52 F = 6.26**	0.91
Drink/drive	MS = 0.57 F = 0.43	MS = 81.34 F = 59.34***	MS = 2.25 F = 1.64	1.37

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Delinquency. There was a significant interaction effect between sensation-seeking and personal fable. The highest delinquent behavior was reported for participants high in both sensation-seeking and personal fable. The lowest delinquent behavior was reported by participants low in sensation-seeking with either low personal fable or high personal fable.

Moderate delinquency was reported by participants low in personal fable but high in sensation-seeking.

Risky driving. There was no significant interaction effect for sensation-seeking and personal fable. There was a significant main effect for sensation-seeking, with participants higher in sensation-seeking ($M = 2.60$) reporting more risky driving than those low in sensation-seeking ($M = 1.79$).

Drug use. There was a significant interaction effect between sensation-seeking and personal fable. The highest drug use was reported for participants high in both sensation-seeking and personal fable. The lowest drug use was reported for participants low in sensation-seeking with either low personal fable or high personal fable. Moderate drug use was reported by participants low in personal fable but high in sensation-seeking.

Discussion

This study examined the relative contributions of egocentrism and sensation-seeking to explain adolescent risk-taking behavior. It builds on previous research that has looked *separately* at egocentrism (e.g. Arnett, 1991; Cantania *et al.*, 1989; Gerrard *et al.*, 1983; Greene *et al.*, 1995, 1996) and sensation-seeking (e.g. Ball, 1995; Donohew *et al.*, 1994; Gillis *et al.*, 1992; Lasora and Shoemaker, 1988) as predictors of various risky behaviors. First, it was found that the disinhibition dimension of sensation-seeking and risk-taking personality contributed significantly to patterns of adolescent risky behavior, specifically to alcohol consumption and delinquency (and to a lesser extent drinking and driving, risky driving and drug use). The structure coefficients for the risky sex and smoking, however, were not as large. To a lesser extent, the experience-seeking, boredom susceptibility and adventure-seeking dimensions of sensation-seeking and the invulnerability dimension of personal fable also contributed significantly to patterns of risk-taking behavior.

The different relations among the four sensation-seeking subscales raises interesting questions. First, different patterns of relations lead one to question the widely used practice of summing the four scales to create a total sensation-seeking score. One conclusion from these data, then, is that disinhibition is markedly different from other sensation-seeking subscales. The correlations between the sensation-seeking subscales and risky behaviors in this study are all positive but ranged in strength. Other researchers have documented these kinds of differences in relations among sensation-seeking subscales (e.g. Thorson and Powell, 1989; Zuckerman, 1994), and Arnett (1990a) even reported changes in direction of correlations with the subscales. These kinds of results should lead to greater caution in examining complex relations with sensation-seeking subscales.

It was also found that there was a consistent relation between the personal fable dimension of egocentrism and sensation-seeking on adolescent risk-taking behavior, such that highest risk behavior was reported by those who were high in sensation-seeking and personal fable, whereas low risk behavior was reported for those who were low sensation-seeking with either high or low personal fable. This pattern was very consistent across many different types of risk-taking behaviors. Only Arnett (1990a, b) looked at egocentrism and sensation-seeking together (and reported no relation, but that may be a measurement issue). Results of the present study indicate clearly (all but one correlation significant and positive) that

egocentrism and sensation-seeking variables together should be examined further, as Melton (1988) and Arnett (1992) suggested.

Theoretical and social implications

The structure of the canonical dependent measure, risky behavior, revealed that although drug use, unsafe driving, delinquency, alcohol consumption, and drinking and driving loaded together on one variate and were similarly predicted by sensation-seeking, risk-taking personality and egocentrism, the dependent measures of smoking and risky sex did not load as strongly. What this suggests is that "risky" behaviors (*cf.*, Arnett 1992, "reckless" behavior) cannot be considered a single construct. Indeed, the same personality and developmental patterns neither similarly nor equally predict all risky behaviors. The related grouping of behaviors (drug use, alcohol use, unsafe driving, drinking and driving, and delinquency) is largely illegal for adolescents and might appropriately be considered antisocial. Sensation-seeking (especially disinhibition), risk-taking personality and the invulnerability dimension of egocentrism are then related to reckless, delinquent or generally illegal behaviors among adolescents but not all risk-taking.

Although drug use, drinking, drinking and driving, and delinquency are socially sanctioned only among some peer groups, smoking and risky sex are socially sanctioned among more and more varied groups of adolescents. In fact, smoking and (risky) sex are considered among many adolescents to be a normal passage into adulthood, whereas other risky behaviors are not. Although all of the behaviors described in this study are truly risky, some are risky and illegal, whereas others are risky but potentially sanctioned or even promoted by adolescent norms. We have, then, two types of risky behaviors: behaviors performed by adolescents who perhaps typically engage in antisocial activity, and risks that are more socially sanctioned and therefore available to more adolescents due to developmental factors of egocentrism. This finding is consistent with Greene *et al.* (1996) who concluded that subjective norms and egocentrism are related to risk-taking behavioral intentions. It is possible that if a risky behavior is seen as normative by adolescents, they are more likely to engage in it regardless of individual difference factors such as sensation-seeking. Most importantly, the risk behaviors themselves are very different and should be treated in the research literature and in public health campaigns as different types of risks, with different predictor variables for engaging in the risk-taking.

The combination of sensation-seeking and personal fable also leads to some interesting conclusions, different from those of Arnett (1990a). First, the effects were consistent across risky behaviors. Those who reported higher sensation-seeking and higher personal fable also reported greatest risk-taking for all risky behaviors. Significant ordinal interactions also occurred for alcohol consumption, risky sex, delinquency and drug use, such that high risk was reported by those high in sensation-seeking and high in personal fable whereas low risk behavior was reported for those low in sensation-seeking and either low or high in personal fable. Overall, the high sensation-seeking group engaged in greater risk behavior, whereas the lower personal fable group had reduced risk behavior only when they were also in the lower sensation-seeking group. As Melton (1988) suggested, there is a need for more research combining these variables.

It seems, then, that sensation-seeking and personal fable may be separate but related constructs (correlations except one positive, range 0.07–0.51), with sensation-seeking predicting risky behaviors, especially when combined with higher levels of personal fable. This seems particularly relevant given the body of research that finds that sensation-seeking

(e.g. Ball, 1995; Donohew *et al.*, 1994; Gillis *et al.*, 1992; Lasora and Shoemaker, 1988) and egocentrism (e.g. Arnett, 1991; Cantania *et al.*, 1989; Gerrard *et al.*, 1983; Greene *et al.*, 1995, 1996) predict risk-taking behavior. Sensation-seeking, as a construct, has been studied in relation to the risk-taking practices of all age groups (*cf.*, Zuckerman). In general, the higher the sensation-seeking score, the greater the risk-taking personality. But in this sample, adolescents were used in order to test a developmental construct: egocentrism, or more specifically, personal fable. It was found that high personal fable (a developmental construct) when combined with high sensation-seeking (an individual difference variable) combine to create particularly at-risk individuals. Although illegal and reckless behaviors are different from more normative risks, both types of risk behavior are predicted by both individual differences and adolescent development. Although being a high sensation-seeking individual may put one at risk for certain risky behaviors, being a high sensation-seeking adolescent in a particular developmental stage may put one at an even higher risk. Thus, practitioners should be encouraged to look at individual differences within the context of development, and research should be conducted examining individual difference variables (Gillis *et al.*, 1992) in combination with developmental factors (Greene *et al.*, 1996).

Limitations

This study used a questionnaire design to investigate adolescents' egocentrism, sensation-seeking and participation in risky behaviors. Although the results prove promising in terms of examining adolescent risky behavior as both an individual difference variable and as a developmental phenomenon, there were some problems with the present study. First, although the junior high and high school sample was varied in terms of age and SES, the college population, in particular, may not have been as varied as possible, especially for race/ethnicity (even with two universities sampled). Because older adolescents were drawn from a sample of college students (as opposed to older adolescents in general), middle and upper middle class individuals may have been over-represented. Among the junior high and high school students, however, a more general population was sampled. Therefore, future research might examine older adolescents from the general population, rather than from a strictly college student population.

As with any study of risk behavior, there is the possibility of social desirability bias, for the risky behavior questions in particular. Further examination of gender and SES differences is warranted. There is an additional question of the reliability of self-report for risk behavior; for these types of behavior, however, it is also difficult to see how to gather data using any other procedure. It is difficult even to estimate whether adolescents might under- or over-report these risk-taking behaviors. For example, it is easy to surmise a situation where a boy might over-report number of past sexual partners while a girl of the same age might under-report her number of past sexual partners (or vice versa, depending on the peer group). Sealing surveys in envelopes should have increased participants' confidence in their anonymity and decreased this tendency. Additionally, using a median split on the egocentrism and sensation-seeking variables may group together people with widely varying experiences.

Future research

Overall, the results of this study demonstrate that future researchers must recognize that not all risk-taking behaviors are the same, nor do they share the same predictors. It appears as if generally illegal and antisocial risk-taking behaviors factor together, whereas smoking and risky sex are not strongly related to these behaviors. It is possible that adolescents themselves

perceive these behaviors as different from one another. Do adolescents perceive illegal behaviors as more risky because there are greater legal and social sanctions against them than against other risky behaviors? Further research might examine adolescent perceptions of risky behaviors and attempt to look at the personality and developmental factors at work in driving these perceptions.

This study also found that sensation-seeking and egocentrism both contribute to adolescents' tendencies to participate in various types of risky behaviors. Future research might attempt to examine further this complex relationship and employ a longitudinal design to further explore these developmental phenomena. It is possible that egocentrism and sensation-seeking vary across adolescents in a way that a single questionnaire cannot fully examine. Particular attention to sex differences will also be important given the consistency of findings for boys' risk-taking behavior in these data.

Finally, this study attempted to demonstrate that developmental factors are at least as important as individual differences in terms of receptiveness to health messages. Developmental factors also allow health messages to be tailored to groups of same-aged adolescents, such as those in a particular grade in high school. Therefore, models created with adolescent development in mind can take us far in designing and implementing programs targeted at youth and ultimately improve prevention messages aimed at them. It will be important to include both psychological and developmental factors in future research. This is an area where further research would be useful.

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