Elaboration in Processing Adolescent Health Messages: The Impact of Egocentrism and Sensation Seeking on Message Processing

By Kathryn Greene, Marina Krcmar, Donald L. Rubin, Lynda Henley Walters, and Jerold L. Hale

The present studies explored how adolescents process information in making decisions about risk behavior. We studied two developmental aspects of adolescent egocentrism: personal fable (a sense of invulnerability) and imaginary audience (focus on others), along with individual difference variables (sensation seeking, self-esteem, and peer pressure). The studies investigated the effects of a message variable, elaboration demand, which is driven by a developmental view of adolescents' cognitive processing. Results of 3 studies indicated the deep elaboration message was partially effective in changing message perceptions and adolescents' intentions to behave in ways to reduce risks. The message type interacted with developmental indicators (age and cognitive development), gender, and topic to explain behavioral intentions, message perceptions and retention.

Adolescents are statistically overrepresented in most categories of risk taking (Arnett, 1992, p. 339). Most adolescents have the knowledge to perceive risk accurately, yet do not incorporate these risks in their decision making (Arnett, 1992). Risk-taking behavior in adolescence is associated with cognitive-social immaturity, but previous health promotion efforts have largely ignored developmental aspects of adolescent information processing. One wave of popular health education programs focused on the social context of risk-taking decisions. For

---

Kathryn Greene is associate professor in the Department of Communication at Rutgers University (4 Huntington St., New Brunswick, NJ 08901; 732-932-7500 x 8115; email: kgreene@scils.rutgers.edu). Marina Krcmar is assistant professor in the Department of Communication Processes at the University of Connecticut. Donald Rubin is professor and Jerold Hale is professor and department head of speech communication at the University of Georgia. Lynda Walters is professor of child and family development at the University of Georgia. Correspondence concerning this article should be addressed to the first author. An earlier version of Study 2 was presented on the Health Division top three panel at the meeting of the National Communication Association, New York, November 1998. Studies 1 and 3 were presented on the Health Division top three panel at the meeting of the International Communication Association, Washington, DC, May 2001.

example, the "Just Say No" program teaches refusal skills, yet this program may actually encourage risk exploration or have no effect. Recent approaches are more comprehensive, including resistance skills, life skills, and normative components. Knowledge and social skills may be necessary, but not sufficient, prerequisites for mature decision making about risk-taking behavior. The question, then, becomes what messages can influence risk-taking decision-making among adolescents?

Individual difference variables (e.g., sensation seeking) have been used to test models and design health messages (e.g., Donohew, Lorch, & Palmgreen, 1998). The value of considering individual difference variables lies in their ability to narrow target audiences. However, isolation of the specific message features of sensation value has proven elusive, and, in any given group, there are likely to be both high and low sensation seekers. In contrast, a developmental approach has the capacity to examine group changes over time, allowing for messages designed to specifically target an entire age cohort. Most health communication message design has used individual difference variables—not development—to predict and explain outcomes. A developmental approach, as opposed to an individual difference approach, would lead to markedly different health campaigns.

When a developmental design is used, messages are made consistent with cognitive or other developmental changes in adolescents. Development is conceived of as qualitative changes that occur throughout childhood and adolescence. These changes result from a combination of biological and social influences, resulting in cognitive changes and development in reasoning strategies, moral reasoning, and emotional growth. This article will focus primarily on adolescents' gains in cognitive perspective taking (cf. Piaget, 1958). To exploit this greater perspective taking, message designers must overcome adolescents' feelings that messages do not apply to them. Message designers must capitalize on adolescents' heightened egocentrism. Current prescriptive messages will not assist in engaging adolescents in thought processes necessary to reach lower risk decisions. One way to encourage deeper processing might be to present messages with few or implicit conclusions and a greater demand for inference making, thereby encouraging adolescents to elaborate arguments and draw conclusions.

The present studies propose a message intervention—message elaboration demand—as a way to address adolescent development and barriers to acceptance of health messages. These studies also examine the impact of sensation seeking and egocentrism.

Review of Literature

Adolescent Egocentrism and Effectiveness of Health Promotion Messages

One developmental approach to message design focuses on egocentrism, that is, an overall focus on self and a lack of differentiation of subject-object interaction (Piaget, 1958). Elkind (1967) argued that egocentrism occurs at transitions between stages of cognitive development resulting in the emergence of two expressions of egocentrism in adolescence. *Imaginary audience* is an inability to differ-

entiate objects of thought, which leads adolescents to believe others are preoccupied with them. The imaginary audience is a product of the adolescent's self-absorbed cognitions and is a normative and other-focused influence. *Personal fable* results from a fascination with one's own thoughts, which adolescents believe are different from the thoughts of others. This leads to a belief in one's uniqueness and invulnerability. Personal fable is characterized by the inability to imagine the self as similar to others, resulting in extreme individuation, a more attitudinal and self-focused influence. Hence, adolescents believe that risks that apply to others do not apply to self.

Adolescents have been found to be highest in both imaginary audience and personal fable in eighth and ninth grade, with a steady decline with age and consolidation of formal operations (Elkind & Bowen, 1979). There are also consistent gender differences with girls scoring higher on imaginary audience measures (e.g., Elkind & Bowen; Greene, Rubin, & Hale, 1995; Lapsley, FitzGerald, Rice, & Jackson, 1989) and boys higher on personal fable measures (e.g., Greene et al.; Lapsley et al.). Thus, gender and age must be included in designing adolescent health messages.

Recent studies (Greene et al., 1995; Greene, Rubin, Walters, & Hale, 1996) were the first to empirically link components of adolescent egocentrism to adolescents' responses to risk messages. They found adolescents' intentions to comply with a safer sex message were mediated by egocentrism. The uniqueness aspect of personal fable inversely predicted attitudes toward risk behavior, and imaginary audience was positively related to the degree to which adolescents were vulnerable to the influence of others. Language explicitness was also found to have an effect on the relation between attitude and personal fable so that an implicit manipulation reduced the negative effect of personal fable on attitude compared to an explicit message. Language explicitness was operationalized as specificity of information. These studies provide important preliminary evidence for the utility of message explicitness and egocentrism.

One particular value of Greene et al.'s (1995, 1996) studies is that they propose a developmental component to explain risk behavior, rather than an individual difference variable. Egocentrism is different in that it provides specific recommendations for messages for developmental *group* by providing information about how adolescents reason about health risks, whereas previous work considered age of receiver in an atheoretic way (if at all). Although age may serve as a proxy for development, it provides little information about tailoring health message content or format.

Sensation Seeking

Sensation seeking has been prominent in previous health communication research (e.g., Donohew et al., 1998; Palmgreen et al., 1991). Sensation seeking taps an individual's need for varied, novel experiences and the willingness to take risks to gain experiences (Zuckerman, 1979). Some research has attempted to identify physiological and biological links to sensation seeking. Sensation seeking has also been associated with a variety of risk behaviors (e.g., cocaine use, sexual behavior, risky driving, and alcohol use).

Donohew, Palmgreen, and colleagues tested the utility of sensation seeking in predicting message effects. High sensation seekers (HSS) have lower arousal levels and require stronger, more exciting messages for attracting and holding attention, but low sensation seekers (LSS) have higher arousal levels and avoid stimuli (e.g., Lorch et al., 1994). Donohew, Helm, Lawrence, and Shatzer (1990) developed drug prevention messages and found that groups most interested in the messages were the HSS nondrug users (more likely to be at risk). They also investigated a message variable called *sensation value*, defined by its ability to elicit sensory, affective, and arousal responses. Messages with high sensation value are more effective for HSS, and sensation value affects attention. LSS also prefer closure at the end of a message (a tag line summing up the message), but HSS prefer to reach their own conclusions. Sensation value, then, is a useful message variable, yet it has been difficult to use sensation value to determine what specific message features to vary in a message campaign (Donohew et al., 1998). Morgan and colleagues (in press) worked with the operationalization questions surrounding message sensation value (MSV). Their study analyzed previously televised antidrug PSAs and reported that audiovisual (e.g., cuts, visual and sound effects) and format features (e.g., surprise ending) were correlated with perceived message sensation value. This work to explore the nature of specific message features associated with MSV will be important for future work.

Adolescent Health Message Processing

Egocentrism and sensation seeking are potentially useful explanations for how adolescents process health risk messages. There is general agreement regarding the modes for cognitive processing of persuasive messages. One mode for processing utilizes message-relevant thinking. Another processing mode involves considering information that is ancillary to the specific content of the message (e.g., Petty & Cacioppo, 1986). These processing modes have not been widely used to explain adolescent responses to risk messages, but they can help explain how message elaboration demand might be effective for adolescent groups.

As adolescents learn more about what their peers think, they gain a better perspective about how they are alike and different from others. Adolescents are also reassured that others are not always thinking about them (cf. imaginary audience). Thus, health messages encouraging the use of nonegocentric thought may be more useful than messages that are intended to provide "correct" answers, increase knowledge, or scare adolescents. Because of the self-absorption and rigidity typical of egocentrism, adolescents are not prone to spontaneously engage in inferential message elaboration. Engaging in discussions to generate, evaluate, or choose alternatives, imagining what is possible in the future, and hypothesizing relations between behaviors and outcomes constitute the kind of active cognitive engagement that may overcome egocentrism. Messages with deep elaboration demand will encourage formal operational, nonegocentric thought and may therefore be optimal for promoting mature decision making.

Social influence literature generally supports the idea that message recipients should be directed toward a specific decision and not left to reach their own conclusions. This literature differentiates between messages that include implicit

or explicit conclusions. With an implicit conclusion, receivers are left to draw conclusions and make final decisions themselves. With explicit conclusions, the message directs the receivers to hold certain attitudes or perform specific behaviors. O'Keefe (1998) distinguishes between two types of implicit and explicit variables: one contrasting messages with explicit conclusions against messages in which the conclusion has been omitted, and one with messages providing a general description of the advocated action compared with messages containing detailed recommendations. In two recent meta-analyses, explicit conclusions produced greater belief, attitude, or behavior change than did implicit conclusions messages (Cruz, 1998; O'Keefe, 1998). That conclusion, however, must be viewed with caution with an adolescent population because of the finding of a moderator for listener involvement (see Cruz, 1998).

Many current risk prevention messages seem vulnerable to critique. Although they may be high in sensory information, they do not demand mental elaboration on the part of message recipients. Many current messages end with a "make the right decision" approach instead of encouraging adolescents to reach these decisions themselves. In particular, health promotion messages may need to model the kinds of mental operations individuals must use to resist riskier behaviors and then provide contexts in which young persons practice those cognitive operations. Many current messages are focused on providing information (increasing knowledge) or scaring adolescents (increasing the likelihood of avoidance rather than increased processing) instead of involving adolescents in decision-making processes.

Study 1

Study 1 explored the validity of the manipulation of the message elaboration demand variable. College students ($N = 87$) completed a shortened version of the survey used in Study 2. Participants were randomly assigned a deep or shallow elaboration demand message that they rated along several dimensions. Tests performed to compare students in Study 1 indicated there were no more significant differences between groups on developmental or individual difference variables than could be expected by chance. Each student was unobtrusively videotaped while reading the message. Then, we coded the length of reading time and analyzed participants' self-reported responses to the message.

Stimulus Messages

We produced two messages for use in the study. The "deep" elaboration demand message explicitly presents few conclusions but requires much elaboration on the part of the receiver. The "shallow" elaboration demand message explicitly presents many conclusions and requires little elaboration by message recipients. The messages were set in a social situation (a school hallway between classes) and depict a role play in which teens make a decision regarding risky sexual behavior. In addition to spoken dialogue, the teen's thought processes are presented as internal monologues. In the decision-making episode, one risky behavior factor

was explored (sexual history of potential partner). For example, the deep elaboration demand passage read, "Lots of people are having sex. . . ." The parallel shallow elaboration demand passage stated, "Lots of people are having sex. And Jimmy really wants to." Message length was similar, with the deep elaboration demand message slightly shorter.

Results

Results from manipulation check items indicated participants perceived differences in the deep and shallow elaboration demand messages as expected. We hypothesized and tested these differences as one-tailed *t*-tests. Power to detect medium-sized effects was .75 (with $p = .05$). Detailed descriptions of the measure of message perceptions appear in the measurement instrument section of Study 2. Factor analyses (varimax) and reliabilities indicated three message perception factors (also in Study 2): message realism, information value, and message similarity (alphas, respectively, .87, .73, .78). The deep elaboration demand message, relative to the shallow elaboration version, resulted in more positive ratings of (a) message realism, $t(84) = -3.75$, $p < .001$, (b) information value, $t(84) = -1.75$, $p = .04$, and (c) message similarity, $t(84) = -2.43$, $p < .01$. Participants also displayed more accurate message recall, $t(84) = -2.52$, $p < .001$, after reading the deep elaboration demand message and responding to a message-specific retention task.

Results from videotaped reading time records corroborated the validity of the elaboration demand manipulation. Three coders, blind to message condition, were trained to assess reading time ($\alpha = .95$). Reading time ranged from 55 to 210 seconds (after eliminating two outliers). Results indicated significant differences between messages, $t(82) = -2.62$, $p < .01$; reading the shallow elaboration demand message ($M = 72.51$, $SD = 20.3$) took *less* time than the deep elaboration message ($M = 85.26$, $SD = 24.2$).

Study 2

After establishing the efficacy of the elaboration demand effect in Study 1, this study tested elaboration demand to determine its effect on adolescents' message processing. Study 2 also tested the abilities of egocentrism, sensation seeking, and gender to predict behavioral intentions and message perceptions in challenging the following hypotheses:

> H1. Adolescents, especially younger/lower in cognitive development, exposed to the deep elaboration demand message will report less risk-taking behavioral intentions, more message receptiveness and retention than those who read the shallow elaboration demand message.
>
> H2. Males will report more risk-taking behavioral intentions and less message receptiveness and retention than females.

H3. Egocentrism (omnipotence, invulnerability, uniqueness, and imaginary audience) will better predict behavioral intention, message receptiveness, and retention than sensation seeking (four subscales: TAS, BS, DIS, ES).

Method

Participants and Procedure

Middle, junior high, and high school students (n = 302) and college students (n = 447) were sampled (N = 749). The students ranged in age from 11 to 29 (M = 18.9, SD = 3.21). The sample included 418 women (55%) and 312 men (43%; 2% did not report gender). Participants were largely Caucasian (83%) or African American (10%). Sixty-five percent of the sample reported previous sexual experience.

College students were recruited from introductory communication courses at two southeastern U.S. universities. There were no significant differences on any variables between responses from the universities, so they were combined for all analyses. Middle, junior high, and high school students were recruited by assistants trained in a research methods course, and they sampled adolescents aged 12 to 17.[1] Adolescents received a questionnaire 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 (survey was sealed in an envelope separate from the consent form to increase confidence in anonymity).

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 (no main or interaction effects for any dependent measures), so they were combined for all analyses. Participants first filled out measures of imaginary audience, personal fable, sensation seeking, and cognitive development and read one randomly assigned message. Participants then returned part 1 to the researcher (or sealed it in an envelope for the noncollege sample) to prevent them from looking back at the message while they were evaluating it. Part 2 consisted of measures of message perception and retention, risk-taking behavior, and behavioral intention. The two stimulus messages were identical to ones described in Study 1, focusing on risky sexual behavior (intended to promote monogamous relations over multiple sexual partners and to promote questions about partner's sexual history).

[1] 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 the specified age ranges. In addition, each data gatherer had to successfully complete a mock participant recruitment session (observed by the first author) before he or she was allowed to collect data. Researchers often contacted potential adolescent participants from their previous high schools and/or their hometowns. Data were primarily drawn from the southeastern U.S. Data on response rate can be estimated only from poststudy discussions, and it was high likely because student researchers approached families with adolescents they knew. Report of permission rate for parents was extremely high (over 95%), and adolescent participation was also high (over 90%).

Measurement Instruments

Behavioral intention measure. This scale tapped participants' intentions to behave in ways that could reduce their risk of contracting HIV through sexual contact and contained six five-point Likert items. Each of the items was presented with responses ranging from *strongly agree* to *strongly disagree*. The scale has been used previously with moderate reliabilities (Greene et al., 1995, 1996, 1997). The present reliability was also low (α = .65) after deleting the abstention item. A lower score indicated more intention to reduce risk behaviors.

Message perception items. We measured perceptions of the message using 11 five-point Likert items we developed, with responses ranging from *strongly agree* to *strongly disagree*. These items were factor analyzed, with a three-factor solution (principal factor analysis, varimax rotation) accounting for 61% of the variance. Criteria included primary loadings greater than .60 with no secondary loadings greater than .35. Factor 1 (eigenvalue = 3.97, 36% variance) was labeled "message realism" (e.g., "This message was realistic") and included four items. Factor 2 (eigenvalue = 1.44, 13% variance) was labeled "information value" (e.g., "I learned a lot from this message") and included two items. Factor 3 (eigenvalue = 1.32, 12% variance) was labeled "message similarity" (e.g., "The people in this message seemed like me") and included three items. We then constructed three composite scales by summing and averaging the items associated with each factor, respectively. Reliabilities of these three subscales were moderate (alphas: realism = .82; information value = .65; similarity = .76). Higher scores on these items indicated more favorable perceptions of the message.

Three message-specific knowledge multiple-choice items tested message retention (e.g., "Where did John and Terry meet?"). The number of items answered correctly (0 to 3) served as the knowledge retention measure.

Cognitive development. General cognitive development was measured with selected items from Form A of "How is your logic?," a Piagetian-based, group-administered written test of cognitive development. Three coders were trained and independently coded items. Any item where coders disagreed was recoded after discussion (initial reliabilities ranged from .75 to .86; final agreement was 100%). Items were used to place each participant in a cognitive stage (preconcrete, concrete I, II, transition, formal I, II), and this stage was used for subsequent analyses (range 1–8; M = 5.8). A higher score indicated more cognitive development.

Imaginary audience. We utilized an 11-item imaginary audience scale (IAS) adapted from a larger scale (Walters et al., 1991). The scale uses four-point Likert-type responses ranging from *always* to *never*. A shorter version was used based on previous factor structures and reliabilities (Greene et al., 1995; Walters et al., 1991). Reliability was good (α = .81). Items were summed and averaged to form a composite scale, with a higher score indicating more imaginary audience ideation.

Personal fable. Here we used the New Personal Fable Scale (NPFS) developed by Lapsley et al. (1989). The NPSF is a 46-item Likert-type measure with three subscales: omnipotence, uniqueness, and invulnerability. The reliabilities for the subscales were uniqueness = .63, invulnerability = .79, and omnipotence = .81. The items were summed and averaged to form three composite scales, with higher scores indicating greater personal fable.

Sensation seeking. Sensation seeking was measured by Form V of Zuckerman's (1994) Sensation Seeking Scale (SSS). The SSS contains 40 forced-choice items comprised of four subscales: experience seeking (ES), thrill and adventure seeking (TAS), disinhibition (DIS), and boredom susceptibility (BS). Reliabilities, assessed by KR20s, were TAS = .82; ES = .60; DIS = .81; BS = .57. The items were summed and averaged to form four composite scales, with higher scores indicating more sensation-seeking traits.

Results

A MANOVA was performed for the behavioral intention, message perception, and retention variables.[2] It revealed significant multivariate effects for age by cognitive development, $\Lambda(4, 619) = .991$, $p < .001$) and message by age interactions, $\Lambda(4, 619) = .993$, $p < .001$, as well as for age, $\Lambda(4, 619) = .963$, $p < .01$, and sex, $\Lambda(4, 619) = .891$, $p < .05$). Follow-up ANOVAs were conducted to test H1 and H2. Power to detect medium-sized effects was .95 (with $p = .05$). Each of the ANOVAS was conducted with the independent variables of elaboration demand, sex, age (categorized as low or high), and cognitive development (categorized as low or high).

H1 predicted an effect for message elaboration demand and age or cognitive development on behavioral intention, message perception, and message retention. We predicted no significant main effects for elaboration demand on intention to comply, message realism, or message similarity, and none were found. There was a main effect for message elaboration on message retention, $F(1,609) = 4.34$, $p < .05$. Participants in the deep demand condition ($M = 2.39$, $SD = .67$) reported more accurate message retention than those in the shallow message condition ($M = 2.23$, $SD = .69$). To further explore the effect of elaboration demand on behavioral intention items, we performed a series of six post hoc *t*-tests comparing message condition on each of the behavioral intent items.[3]

As predicted, there were significant two-way interactions for age or cognitive development with elaboration demand. First, there was a significant elaboration demand by cognitive development interaction on behavioral intention, $F(1,609) = 2.96$, $p < .05$. Those who read the deep message and were low in cognitive development reported least risk-taking behavior ($M = 2.07$, $SD = .65$) compared with deep message, high cognitive development ($M = 1.99$, $SD = .70$) and shallow

[2] Copies of correlation matrices and measures are available from the first author.

[3] For intent to ask partner about sexual history, $t(430) = -1.98$, $p < .05$ and intent to be monogamous, $t(431) = -2.02$, $p < .05$, those who read the deep elaboration demand version had significantly more intent to reduce risk behaviors compared with those who read the shallow elaboration demand message. Participants who read the deep elaboration demand message ($M = 1.57$, $SD = .91$) reported more intent to ask about partner's history than those who read the shallow elaboration demand message ($M = 1.72$, $SD = 1.06$). Participants who read the deep elaboration demand message ($M = 1.69$, $SD = 1.07$) also reported more intent to be monogamous than those who read the shallow elaboration demand message ($M = 1.87$, $SD = 1.19$). The differences for the other four behavioral intention variables were not significant. Therefore, deep elaboration demand messages contributed to reducing risky behavior only in message content-specific items.

message, low or high cognitive development (M = 1.99, SD = .59, and M = 2.01, SD = .67, respectively). For message realism, $F(1,609) = 3.08$, $p < .05$, there was a significant message by age interaction so that those who read the deep message and were younger (M = 2.67, SD = .63) or older (M = 2.67, SD = .77) reported more message realism than those who were older and who read the shallow message (M = 2.53, SD = .64). This provides some support for H1.

There was also an unpredicted gender by message elaboration interaction for message retention, $F(1,609) = 2.85$, $p < .05$, such that women who read the deep message (M = 2.47) had more accurate message retention compared with women who read the shallow message (M = 2.28) and with men who read either the shallow message (M = 2.21) or the deep demand message (M = 2.26). There were no significant three- or four-way interactions for elaboration demand; however, there were unpredicted main effects by age and cognitive development.[4]

H2 predicted an effect for gender on behavioral intention, message perceptions, and message retention. Overall, men (M = 2.29, SD = .65) had significantly less intent to reduce risk behaviors, $F(1,609) = 64.9$, $p < .001$, than women (M = 1.81, SD = .58). The ANOVA for message realism, $F(1,609) = 8.49$, $p < .01$, revealed that men (M = 2.54, SD = .76) perceived the message as significantly less realistic than women (M = 2.73, SD = .63). Finally, women (M = 2.38, SD = .80) had more accurate message retention, $F(1,609) = 7.37$, $p < .01$, than men (M = 2.22, SD = .76). There were no differences by gender for similarity, $F(1,609) = 1.86$, p = ns. Therefore, H2 is generally supported.

For Hypothesis 3, regressions were run to test whether cognitive development, sensation-seeking, or egocentrism variables were better predictors of behavioral intention and message perception variables. Gender, age, and cognitive development were entered on the first step, the four sensation-seeking subscales on the second step, and the four egocentrism variables (three personal fable and imaginary audience) on the final step. This regression was run four times, first predicting behavioral intention and then the message perception and retention variables.

Behavioral intention. The first step was significant, $F(3,508) = 19.6$, $p < .001$, Adj. $R^2 = .10$). The change for the second step was also significant, $F(7,504) = 22.4$,

[4] We also examined the effects of age and cognitive development. Results for the dichotomized cognitive development variable indicated significant main effects for message perception variables. For message realism, there was a significant main effect for cognitive development such that those low in cognitive development (M = 2.75, SD = .64) reported more message realism than those high in cognitive development (M = 2.59, SD = .71). For message similarity, there was a significant main effect for cognitive development such that those low in cognitive development (M = 3.08, SD = .88) reported more message similarity than those high in cognitive development (M = 3.45, SD = .86). Finally, for message retention there was a significant main effect for cognitive development such that those high in cognitive development (M = 2.38, SD = .74) reported more accurate message retention than those low in cognitive development (M = 2.19, SD = .84).

Results for the dichotomized age variable indicated a significant main effect for message similarity; specifically those younger (M = 2.83, SD = .92) saw the message as more similar than older participants (M = 2.52, SD = .81).

There was also a significant interaction effect for age and cognitive development for message retention such that those older and high in cognitive development (M = 2.07) reported more accurate retention compared with older and low cognitive development (M = 2.18) and younger low (M = 2.20) or high cognitive development (M = 2.27).

$p < .001$, R^2 Cg. = .14). The change for the third step was not significant. The final behavioral intention model contained three significant variables: gender ($\beta = -.24$, $p < .001$), sensation-seeking TAS ($\beta = -.17$, $p < .01$), and sensation-seeking DIS ($\beta = .35$, $p < .001$). Men, individuals higher in thrill and adventure seeking and lower in disinhibition, had greater intent to engage in risk behaviors.

Message realism. The first step was significant, $F(3,507) = 3.71$, $p < .01$, Adj. $R^2 = .02$). The change for the second step was also significant, $F(7,502) = 4.12$, $p < .01$, R^2 Cg. = .03). The change for the third step was not significant. The final message realism model contained three significant variables: age ($\beta = -.10$, $p < .05$), imaginary audience ($\beta = .09$, $p < .05$), and sensation-seeking BS ($\beta = -.16$, $p < .01$). Those higher in imaginary audience, but younger and lower in boredom susceptibility, reported the message was more realistic.

Information value. The first step was significant, $F(3,515) = 14.2$, $p < .001$, Adj. $R^2 = .08$). The change for the second step was not significant, $F(7,511) = 1.35$, $p =$ ns, R^2 Cg. = .01). The change for the third step was significant, $F(11,507) = 3.81$, $p < .05$, R^2 Cg. = .03). The final information value model contained three significant variables: age ($\beta = -.20$, $p < .001$), cognitive development ($\beta = -.22$, $p < .001$), and personal fable uniqueness ($\beta = -.17$, $p < .001$). Those older, higher in cognitive development, and higher in feelings of uniqueness reported the message was less useful.

Message similarity. The first step was significant, $F(3,514) = 7.91$, $p < .001$, Adj. $R^2 = .04$). The change for the second step was also significant, $F(7,510) = 20.6$, $p < .001$, R^2 Cg. = .13). The change for the third step was not significant. The final similarity model contained three significant variables: cognitive development ($\beta = -.10$, $p < .05$), sensation-seeking DIS ($\beta = .37$, $p < .001$), and sensation-seeking ES ($\beta = .10$, $p < .05$). Those higher in cognitive development, experience seeking and disinhibition reported viewing the message as less similar.

Message retention. The first step was significant, $F(3,504) = 7.35$, $p < .001$, Adj. $R^2 = .04$). The change for the second step was not significant, $F(7,500) = 2.01$, $p =$ ns, R^2 Cg. = .02). The change for the third step was not significant. The final model predicting message retention contained three significant variables: age ($\beta = .15$, $p < .001$), cognitive development ($\beta = .18$, $p < .001$), and experience seeking (ES; $\beta = -.15$, $p < .001$). Participants who are older, more cognitively developed, and lower in ES had more accurate retention.

Summary of regressions. The regression models showed some consistent patterns. Sensation seeking was a predictor of behavioral intention, message similarity, and retention. Cognitive development was a predictor of information value, message similarity, and message retention. Egocentrism was a predictor of message information value. Sensation seeking and egocentrism equally predicted message realism. Gender and age also were significant in models.

Discussion

This study examined the contributions of several factors to adolescent risk-taking behaviors and to susceptibility to a safer sex message. Of main interest were a

message variable (elaboration demand), egocentrism, sensation seeking, and cognitive development. It was hypothesized that adolescents, especially younger ones, would respond more profoundly to a message with greater elaboration demand than one requiring less processing. Younger adolescents, with their higher levels of personal fable and imaginary audience, should be particularly susceptible to messages that involved them in drawing conclusions. It also seemed likely that adolescents generally, and not only younger and less cognitively advanced ones, might be affected. Was this the case?

Message effects were evident for some outcome variables. As predicted, deep elaboration demand messages were more likely to result in intent to ask about partners' history and intent to be monogamous than shallow elaboration demand messages (see note 3). Partners' history and monogamy were the two issues addressed explicitly in the stimulus message. Therefore, there was an effect for message on behavioral intention, but only where it related specifically to the content of the message scenario. There was no main effect of message elaboration demand on adolescents' message perceptions or message retention. These findings contradict results of recent meta-analyses by Cruz (1998) and O'Keefe (1998). Both reported that explicit messages were somewhat more effective than implicit messages, but Cruz also reported a slight moderator for involvement. The variable that was positively affected by deep processing demand worked in part because the adolescents were prompted to engage in, draw conclusions about, and become involved in the message. However, our hypotheses related not only to deep versus shallow elaboration demand but also to the interaction between cognitive development and message condition. Consistent with our predictions, those who were younger and less cognitively advanced who also read the deep demand message reported the least risk-taking intentions and rated the message as more realistic. That serves as initial evidence that deep demand processing is effective, and that this type of message is most effective with younger adolescents who are lower in cognitive development and at the peak of egocentrism. Engaging deeply in reasoning about risk taking helps surmount processing problems associated with adolescent egocentrism.

Second, it was hypothesized that males would be less affected by either message and would report less intention to reduce risk and less message retention than females. These results are consistent with that reasoning. Males were less affected by either the deep or shallow elaboration demand than females, and women reported more intentions to avoid risk behavior, more message realism, and more accurate message retention. Greene et al. (1997) reported that, for female adolescents, attitude was a better predictor of behavioral intentions than was subjective norm, but for males, subjective norm was a better predictor of persuasive outcomes than was attitude. Such information will be crucial when considering message development because it would lead to messages for women focused on individual attitudes but messages for men focused on norms or peer influence. The present study indicates messages targeting women are likely to be seen as more realistic and accurately retained, but messages specifically targeting men must be designed to be much more realistic (perhaps with increased sensation value).

Third, we predicted that sensation seeking and egocentrism would both explain variance in adolescents' risk-taking behavior and in their message perceptions, but that cognitive development and egocentrism would explain more variance than sensation seeking. These hypotheses were partially supported. Contrary to our expectations, egocentrism accounted for only a small portion of variance and, even then, only for a limited set of dependent variables. Adolescents who reported more invulnerability saw the message as less realistic and reported less intent to reduce risk behaviors, and those higher in uniqueness reported less message similarity. This is consistent with research reported by Greene et al. (1995, 1996), in which the invulnerability component of personal fable was negatively correlated with intentions.

Sensation seeking, on the other hand, was a better and more consistent predictor of intentions, message perceptions, and retention. Adolescents with low disinhibition and high thrill and adventure seeking reported more intent to reduce risky behavior. In addition, those with high boredom susceptibility reported less message realism. Disinhibition also related to judgments of message similarity, so that those scoring low on DIS and ES saw the characters in the scenarios as similar to themselves. Disinhibition may be the most useful type of sensation seeking when explaining this type of risk behavior. The different patterns of correlations among the sensation-seeking subscales should be examined further.

Lastly, cognitive development consistently accounted for as much or more variance than either sensation seeking or egocentrism. It was positively related to message retention and to perceptions of the message providing more information. Cognitive development was an especially strong predictor of retention and perceived message usefulness. Sensation seeking is related to behavioral intention, message realism, and similarity. The focus of message development and message design may need to vary. When knowledge is of greatest concern, cognitive development is a useful tool in understanding adolescent message response. If behavioral intention change is most important, sensation seeking should be the focus.

Study 3

We undertook an additional study to further explore the message elaboration demand feature. Because we found differences for elaboration demand messages only by message-specific items in Study 2, we felt replication and extension were warranted. It is likely that deep elaboration demand messages would affect the behavioral intentions of adolescents, but that those effects might be very specific. For example, a message about smoking tobacco may have no effect on intentions regarding chewing tobacco. A message about drinking and driving may not affect overall intentions to reduce drinking. With the limited range of topics and measured behavioral intentions from Study 2, it was unclear exactly how specific the message effects might be. Hence, Study 3 used different scenarios and measures related to these new behaviors. The design therefore enabled a test of the message-specific effects and the previous predictor variables.

H1. There will be a topic by message elaboration effect such that behavioral intention will be greater only in the deep demand and topic-relevant conditions.

The results of previous studies (e.g., Greene et al., 1995) indicated that normative influences should be considered in addition to sensation seeking and egocentrism. The impact of normative influences on risk behavior and message perceptions will be investigated.

RQ1. Which of the following will best predict behavioral intentions and message receptiveness: personal fable and imaginary audience, sensation seeking, peer pressure, self-esteem, or age?

Method

In Study 3, we manipulated elaboration demand in two scenarios (deep, shallow) identical to the procedure employed in Studies 1 and 2. The message scenarios, however, included three new topics and settings. Messages addressed the dangers of drinking and driving (at a party), smoking (friends at the mall), or dip or chewing tobacco (in the school cafeteria). Thus, there were a total of six message conditions (3 topics x 2 elaboration demand). Each participant received a survey including one randomly assigned message.

Participants included middle, junior high, and high school students (n = 342) recruited through sampling procedures similar to Study 2 and college students (n = 190) recruited through introductory communication courses at a southeastern U.S. university. Participants (N = 532) ranged in age from 12 to 25 (M = 16.01, SD = 2.71) and were 49% female and 74% Caucasian (21% African American).

Measurement Instruments

The survey measured several variables, including message perceptions, imaginary audience, personal fable, self-esteem, sensation seeking, peer pressure, behavioral intention, and demographics. The sensation-seeking measure was identical to that described in Study 2 but was summed to form one scale. The imaginary audience measure in this study was a shortened form of the measure used in Study 2 and included six items (α = .79). The personal fable measure was a shortened form of the NPFS and included 18 items (α = .82) combined to form one scale.

Self-esteem was measured by 10 five-point Likert items, for example, "I feel I am a likable person" and "I feel that I am a competent person." Higher scores indicated more positive self-esteem. The reliability was moderate (α = .76).

Peer pressure was measured by 6 five-point Likert-type items developed by Walters et al. (1991). Higher scores indicated more peer pressure, and the reliability was good (α = .84).

Perceptions of the message were measured with 14 Likert-type items expanded from Study 2, and the four-item AIME (amounts of invested mental effort) measure (α = .81). The factor analysis revealed the same three-factor solution from Study

2: message realism (α = .78), message similarity (α = .81), and information value (α = .84). Higher scores on all message perception variables indicated more positive perceptions.

Behavioral intentions were measured by Likert-type items similar to those in Study 2, but topics included dip, cigarette smoking, and alcohol use to match stimulus messages. Several intention items tapped amount of alcohol use, frequency of alcohol use, and drinking and driving. Dip/chew and cigarette intentions were both assessed with single items. A lower score indicated less risk-taking behavioral intention.

Results

Because of differences in message topics, data from Study 3 were analyzed differently for the behavioral intention and message perception variables. Hypothesis 1 predicted an interaction effect for topic by demand on message-specific behavioral intention variables, and this was generally supported. For behavioral intention measures, we conducted a series of *t*-tests. For subjects within topic, tests compared the deep and shallow message for the matched behavioral intention item. For smoking cigarettes, the deep elaboration demand message (M = 1.26, SD = .95) was effective, $t(171) = 2.05$, $p < .05$, in decreasing intent to smoke (shallow message M = 1.59, SD = 1.11). For the intent to drink and drive variable, the deep elaboration message (M = 1.18, SD = 1.56) was effective, $t(179) = 2.31$, $p < .05$, in decreasing intent for the drinking message (shallow message, M = 1.47, SD = 1.58). The fact that no such effect emerged for overall alcohol intent, $t(179) = 1.74$, p = ns, lends to credence the effectiveness of elaboration demand only by specific topic (as in Study 2). Results for the dip message were nonsignificant largely because the dipping or chewing message was liked much less than the other messages.

An initial MANOVA for the message perception variables revealed significant multivariate effects for the sex by topic and age interactions, $\Lambda(8, 776) = .976$, $p < .01$, as well as for topic, $\Lambda(8, 476) = .942$, $p < .05$, and sex, $\Lambda(4, 488) = .934$, $p < .05$. The message perception variables were subjected to a series of 2 (message condition) X 2 (gender) X 3 (topic) ANOVAs. Power to detect medium-sized effects was .95 (with p = .05). There were significant effects by topic for message perception variables. Specifically, participants reported the drink and drive message, $F(2,491) = 4.73$, $p < .01$, to be the most informative (M = 2.88, SD = .78), followed by smoking (M = 3.01, SD = .81) and then chew/dip (M = 3.18, SD = .84). Participants also reported the drink and drive message, $F(2,491) = 11.5$, $p < .001$, to be the most similar (M = 3.00, SD = .96), followed by smoking (M = 3.26, SD = .90) and then chew/dip (M = 3.48, SD = .93). There were no differences by topic on the AIME or message realism variables.

There were no significant effects by elaboration demand for the message perception variables. However, there were effects such that participants who read the deep elaboration demand message reported higher amounts of invested mental effort (AIME), $F(1,492) = 2.93$, and message similarity, $F(1,492) = 2.59$, than those

who read the shallow message. There were no significant interaction effects for message perceptions. The findings for gender are also reported in regressions, but there were significant gender differences for AIME, $F(1,492) = 3.78$, $p < .05$, message realism, $F(1,492) = 5.89$, $p < .01$, and information value, $F(1,492) = 19.4$, $p < .001$.

A research question asked whether personal fable, imaginary audience, sensation seeking, peer pressure, self-esteem, egocentrism, or age would best predict intentions and message receptiveness. A series of regressions addressed this question. Control variables (gender, age) were entered on the first step, the social variables (peer pressure, self-esteem) on the second step, and personality and developmental variables (sensation seeking, imaginary audience, personal fable) on the final step. This regression was run seven times, predicting the behavioral intention and message perception variables.

Cigarettes. The first step was significant, $F(2,421) = 4.6$, $p < .01$, Adj. $R^2 = .02$. The change for the second step was not significant. The change for the third step was significant, $F(7,416) = 8.93$, $p < .001$, R^2 Cg. = .04. The final model predicting intent to use cigarettes contained two variables: age ($\beta = -.32$, $p < .001$) and sensation seeking ($\beta = .10$, $p < .05$). Adolescents higher in sensation seeking and older reported more intent to smoke cigarettes.

Dip/chew. The first step was significant, $F(2,421) = 17.7$, $p < .001$, Adj. $R^2 = .08$). The change for the second step was not significant. The change for the third step was significant, $F(7,416) = 2.91$, $p < .05$, R^2 Cg. = .02). The final model predicting intent to dip/chew contained two variables: gender ($\beta = -.18$, $p < .001$) and age ($\beta = .13$, $p < .05$). Males and older adolescents reported more intent to dip/chew tobacco.

Alcohol use. The first step was significant, $F(2,408) = 72.7$, $p < .001$, Adj. $R^2 = .27$. The change for the second step was not significant. The change for the third step was significant, $F(7,403) = 17.4$, $p < .001$, R^2 Cg. = .08). The final model predicting intent to use alcohol contained three significant variables: sensation seeking ($\beta = -.28$, $p < .001$), gender ($\beta = -.10$, $p < .05$) and age ($\beta = .42$, $p < .001$). Adolescent males and those higher in sensation seeking and older reported more intent to use alcohol.

Message realism. The first step was significant, $F(2,415) = 4.62$, $p < .05$, Adj. $R^2 = .02$). The change for the second step was not significant. The change for the third step was significant, $F(7,410) = 7.95$, $p < .001$, R^2 Cg. = .05. The final model predicting message realism contained one significant variable: sensation seeking ($\beta = -.23$, $p < .001$). Adolescents higher in sensation seeking reported the message was less realistic.

Information value. The first step was significant, $F(2,413) = 14.8$, $p < .001$, Adj. $R^2 = 07$). The change for the second step was not significant. The change for the third step was significant, $F(7,408) = 19.1$, $p < .001$, R^2 Cg. = .12. The final model predicting message information value contained three significant variables: sensation seeking ($\beta = -.32$, $p < .001$), imaginary audience ($\beta = -.14$, $p < .01$), and gender ($\beta = -.11$, $p < .05$). Females and those lower in sensation seeking and imaginary audience reported the message was more useful or contained more valuable information.

Message similarity. The first step was not significant. The change for the second step was significant, $F(4,409) = 3.31$, $p < .05$, R^2 Cg. = .02). The change for the third

step was not significant. The final model predicting message similarity contained two significant variables: age (β = -.12, $p < .05$) and imaginary audience (β = -.12, $p < .05$). Those who were older and higher in imaginary audience saw the characters in the messages as less similar.

AIME. The first step was not significant. The changes for the second and third steps were not significant. The final model predicting AIME contained one significant variable: gender (β = -.11, $p < .05$). Females reported investing more effort reading the message.

Discussion

Results of Study 3 are generally consistent with those reported in Studies 1 and 2, but Study 3 allowed for extensions of the previous work. As predicted, message elaboration interacted with topic. The findings provide further evidence of the utility of the elaboration demand message to predict intentions and, less strongly, message perceptions. Results suggested that messages requiring adolescents to deeply process messages and draw their own conclusions are more likely to have positive outcomes. However, intention to comply is specific to the message topic. Messages that targeted drinking and driving, for example, had no effect on general drinking behavioral intentions. Therefore, message designers must recognize that effective messages must provide a careful balance: They must target specific topics yet not be overly explicit in their conclusions.

Results by topic were important, reinforcing findings from Study 2. Intention to reduce risky behavior paralleled the specific risky behavior being targeted by the message. This pattern of findings was particularly clear in the case of alcohol use. The deep elaboration message that targeted drinking and driving decreased the reported likelihood of drinking and driving but had no effects on overall drinking intentions. It appears, from these results and those from Study 2, that adolescents do not extend or generalize information about one behavior (e.g., smoking cigarettes at a party) to other, even similar, behaviors (e.g., chewing tobacco). There were effects by gender and age similar to age and cognitive development effects of Study 2. Consistent with previous research, females viewed messages more positively and reported less risk-taking behavior intentions than males and older adolescents. This continues to provide evidence for effective targeting of risk messages by age and gender, as well as development.

Summary

The three studies presented here propose a new message feature, message elaboration demand, and reveal how it can be used to target adolescent risk-taking behaviors. Results are quite promising. They reveal effects for several risk scenarios and demonstrate how the message interacts with topic, gender, and developmental indicators.

Results presented here provide specific, theoretically driven recommendations

for health messages targeting adolescents. Interventions that require the use of deep elaboration demand may be more useful than prescriptive messages or those intended to increase knowledge or scare adolescents. Messages must cause adolescents to actively question what they believe and what they think those around them believe. Getting adolescents involved in deeper thought processes about risky behaviors is an important step in encouraging them to make good decisions. This process seems to help adolescents arrive at the decision by determining what it is best for them. Engaging in discussions that generate, evaluate, and lead to choosing of alternatives, imagining what is possible in the future, and hypothesizing relations between behaviors and outcomes will facilitate independence of thought and strength of character that we expect to guide mature decision making. It might be possible to depict more elaborate role plays encouraging adolescents to weigh alternatives. Media messages could present alternative solutions but allow audience members to draw their own conclusions rather than depicting a "right" response.

Theoretical Implications

One reason prevention messages may fail to affect adolescent behavior is that egocentrism inhibits deep cognitive processing of messages. One value of the present studies is that they propose a developmental component to explain risk behavior. Consideration of developmental factors could add significantly to message design for groups of adolescents. Considering egocentrism or development is markedly different from other approaches because doing so provides specific recommendations for message design by developmental group, taking into account how adolescents, as a group, reason about health risks. The present studies demonstrate that messages interact with age, cognitive development, and topic. Sensation seeking also contributed to explaining intentions and message perceptions in consistent ways in these studies, but cognitive development and imaginary audience also showed promise for further study.

There are definitional problems that should be addressed in this area, and examination of egocentrism, personal fable in particular, may assist in this process. Sensation seeking (and risk taking) indeed look similar to personal fable and are likely related, but they are different because sensation seeking neither increases nor diminishes across all adolescents, as personal fable does, because the cognitive processes underlie and are prior to stimulus seeking.

There has been little research available on developmental trends in risk perception. If there is an important message, such as protection from risk behavior, it is useful to know how adolescents think about this behavior. Focusing on a recipient's sophistication of processing and understanding information is very different from furnishing information and facts. For risk prevention programs to succeed, it will be necessary to focus on the process of decision making.

Limitations and Future Research

There are limitations to the designs of these studies. More message exposures and delayed posttests would be preferable. The messages were also read, and many messages of this type are currently distributed as short, televised PSAs, posters, or

billboards, which were not tested in these studies. The sampling plan could have produced a distorted representation of adolescents in the area, and sampling from the southeastern U.S. might also produce bias in terms of social or religious attitudes and behaviors.

Much research on health messages has been atheoretical. In fact, many past studies have been limited to reporting frequencies or correlations, for example, on knowledge of AIDS and salience measures. Although this information can be useful to assess baseline levels, it has been collected in a theoretical vacuum and provides little information about relations among variables. As a result, some researchers have been able to provide very limited general recommendations for how to communicate risk messages to adolescents. There is a continued need for theoretically based work in risk taking from a message design perspective. The present studies are a step toward applying theory to this area. Other research on health promotion messages must take group variables such as gender and cognitive development into account. There is still much work to be done in the area of risk messages. The results for message elaboration demand were complex, considering the interactions. There was no simple recommendation proposed to use either deep or shallow elaboration demand messages, and this should be a caution to other researchers.

References

Arnett, J. (1992). Reckless behavior in adolescence: A developmental review. *Developmental Review, 12,* 339–373.

Cruz, M. G. (1998). Explicit and implicit conclusions in persuasive messages. In M. Allen & R. Priess (Eds.), *Persuasion: Advances through meta-analysis* (pp. 217–230). Cresskill, NJ: Hampton Press.

Donohew, L., Helm, D., Lawrence, P., & Shatzer, M. (1990). Sensation seeking, marijuana use, and responses to drug abuse prevention messages. In R. Watson (Ed.), *Prevention and treatment of drug and alcohol abuse* (pp. 73–93). Clifton, NJ: Humana.

Donohew, L., Lorch, E. P., & Palmgreen, P. (1998). Applications of a theoretic model of information exposure to health interventions. *Human Communication Research, 24,* 454–468.

Elkind, D. (1967). Egocentrism in adolescence. *Child Development, 38,* 1025–1034.

Elkind, D., & Bowen, R. (1979). Imaginary audience behavior in children and adolescents. *Developmental Psychology, 15,* 38–44.

Greene, K., Hale, J. L., & Rubin, D. L. (1997). A test of the theory of reasoned action in the context of condom use and AIDS. *Communication Reports, 10,* 21–33.

Greene, K., Rubin, D. L., & Hale, J. L. (1995). Egocentrism, message explicitness, and AIDS messages directed toward adolescents: An application of the theory of reasoned action. *Journal of Social Behavior & Personality, 10,* 547–570.

Greene, K., Rubin, D. L., Walters, L. H., & Hale, J. L. (1996). The utility of understanding adolescent egocentrism in designing health promotion messages. *Health Communication, 8,* 131–152.

Lapsley, D. K., FitzGerald, D. P., Rice, K. G., & Jackson, S. (1989). Separation-individuation and the "new look" at the imaginary audience and personal fable: A test of an integrative model. *Journal of Adolescent Research, 4,* 483–505.

Lorch, E. P., Palmgreen, P., Donohew, L., Helm, D., Baer, S. A., & Dsilva, M. U. (1994). Program context, sensation seeking, and attention to televised anti-drug public service announcements. *Human Communication Research, 20,* 390–412.

Morgan, S. E., Palmgreen, P., Stephenson, M. T., Hoyle, R. H., & Lorch, E. P. (in press). Associations between formal message features and subjective evaluations of the sensation value of anti-drug public service announcements. *Journal of Communication*.

O'Keefe, D. J. (1998). Justification explicitness and persuasive effect: A meta-analytic review of the effects of varying support articulation in persuasive messages. *Argumentation & Advocacy, 35,* 61–75.

Palmgreen, P., Donohew, L., Lorch, E., Rogus, M., Helm, D., & Grant, N. (1991). Sensation seeking, message sensation value, and drug use as mediators of PSA effectiveness. *Health Communication, 3,* 217–234.

Petty, R. E., & Cacioppo, J. T. (1986). *Communication and persuasion: Central and peripheral routes to attitude change*. New York: Springer-Verlag.

Piaget, J. (1958). *The growth of logical thinking from childhood to adolescence*. New York: Basic Books.

Walters, L. H., McCoy, K., Chapman, S., Boyd, B., Hollett, N., & Beare, V. (1991). *Relationship of perceived peer pressure and imaginary audience ideation*. Unpublished manuscript, Department of Child and Family Development, University of Georgia, Athens, GA.

Zuckerman, M. (1979). *Sensation seeking: Beyond the optimal level of arousal*. Hillsdale, NJ: Erlbaum.

Zuckerman, M. (1994). *Behavioral expressions and biosocial bases of sensations seeking*. New York: Cambridge University Press.