

CONSTRUCTION OF SMOKING-RELEVANT HEALTH RISK PERCEPTIONS
AMONG COLLEGE STUDENTS:
THE INFLUENCE OF NEED FOR COGNITION AND MESSAGE CONTENT

by

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Construction of Smoking-Relevant Risk Perceptions Among College Students:
The Influence of Need for Cognition and Message Content

Jennifer Elaine Irvin

ABSTRACT

The primary purpose of this study was to examine the potential joint influence of need for cognition (NC), the dispositional preference for engaging in (or avoiding) effortful cognitive processing of information, and type of smoking risk message (i.e., factual and evaluative messages similar in message content and length) on the construction of smoking-relevant risk perceptions among college smokers. A secondary purpose was to examine potential mechanisms through which changes in risk perception might occur. 227 college smokers evaluated one of three pamphlets, (1) a factual (i.e., primarily fact-based) smoking risk pamphlet, (2) an evaluative (i.e., primarily emotion based) smoking risk pamphlet, or (3) a control pamphlet unrelated to smoking. Among occasional smokers, NC interacted with type of risk message to influence perceptions of post-pamphlet risk for several of the risk perception outcomes examined. Specifically, smokers lower in NC reported higher levels of perceived risk in response to the evaluative pamphlet whereas smokers higher in NC reported greater perceived risk in response to the factual pamphlet. The interaction did not predict risk perception outcomes among daily smokers. Significant changes in the mechanisms examined were

not observed. Findings provide evidence that NC interacts with type of smoking risk message to influence changes in smoking-related health risk perceptions among occasional college smokers. Theoretical and practical implications are discussed.

Chapter 1

Introduction

Most health problems in the United States are largely attributable to the practice of unhealthy behaviors (e.g., smoking, poor diet, sedentary lifestyle, substance abuse, risky sexual practices). Therefore, it is change in behavior, rather than medical innovation, that is likely to have the greatest potential to reduce health-related morbidity and mortality (Salovey, Rothman, & Rodin, 1998). A logical first step toward promoting large-scale health behavior change has been to warn the public about specific health risks associated with the initiation and maintenance of unhealthy behaviors. Toward that end, educational media campaigns have provided an efficient means of disseminating a vast amount of health risk information to a large number of people. A primary focus of such campaigns has been to inform the public of the dangers of cigarette smoking and the potential benefits of cessation. Despite these efforts, fully 25.5% of Americans continue to smoke (CDC, 1996). Moreover, the prevalence of smoking among adolescents is increasing (CDC, 1995).

Health Risks of Smoking and Benefits of Cessation

Compared to other unhealthy behaviors, smoking is associated with an extremely high level of risk (Hersch & Viscusi, 1998; U.S. Department of Health and Human Services [USDHHS], 1990). It is estimated that roughly one-third of all cancer-related deaths in our society result from smoking (Cincirpini & McClure, 1998) and for

continuing lifetime smokers, the proportional risk of dying from a smoking-related disease has been estimated to be as high as one in two (Doll, Peto, Wheatley, Gray, & Sutherland, 1994). Further, smoking is closely linked with additional short-term and long-term health consequences including respiratory infections, reduced lung capacity, heart disease, chronic obstructive pulmonary disease, stroke, and emphysema (USDHHS, 1989).

Although smoking increases one's risk of cancer and other diseases, cessation results in considerable health benefits. Specifically, quitting smoking has been demonstrated to reduce one's chances of developing cancer and may even increase length of life in those individuals already affected by cancer. The risk of developing lung cancer decreases by 30% to 50% following cessation, depending on length of abstinence. Three to five years after cessation, one's risk of oral cancer is reduced by 50%; 10 years after cessation, the risk is reduced to that of a nonsmoker (Cincirpini and McClure, 1998). If cigarette smoking were eradicated completely, cancer deaths would be reduced by 25% and fatal heart attacks would decline by 350,000 each year (Taylor, 1990).

Risk Perceptions and Health Behavior

Because almost one-third of smokers make an attempt to quit smoking every year, improving their overall success rate by as little as one percent would markedly reduce the incidence of smoking-related health problems (Fiore et al., 1990). From this perspective, it seems that large-scale educational campaigns may have the clearest potential to reduce rates of preventable illness and death in the United States. The rationale behind such campaigns is that individuals are typically unaware of the health risks associated with unhealthy behaviors and that acknowledgement of risk will motivate health behavior

changes (Weinstein, 1984). The latter assumption is consistent with a number of widely accepted and influential theoretical models of health behavior change including the Health Belief Model (Becker, 1974; Janz & Becker, 1984), the Theories of Reasoned Action (Ajzen & Fishbein, 1980) and Planned Behavior (Ajzen, 1985, 1991), and Protection Motivation Theory (Rogers, 1983). In general, the models assume that people form some estimation of the health risks associated with a behavior, evaluate the potential costs and benefits of taking action, and then choose a course of action that is consistent with an expected outcome. Although perceptions of health risk alone are not thought to be sufficient to directly cause behavior changes, they are believed to serve as an important source of motivation driving decisions to adopt risk-reducing behaviors. Clearly, individuals must possess at least a general awareness of the health risks associated with unhealthy behaviors before they are likely to become inclined to modify those behaviors.

Despite their assigned importance within the models of health behavior, surprisingly little is known about how risk perceptions are actually constructed or how they may change over time. That is, the process by which new information is filtered and subsequently incorporated within, or excluded from, perceptions of risk is not well understood (Borland, 1997; Rothman & Schwartz, 1998; Weinstein, 1998). Several studies have found a robust tendency for smokers to underestimate their personal vulnerability to smoking health risks despite acknowledging that smoking is generally harmful (Boney-McCoy et al., 1992; Lee, 1989; Schoenbaum, 1997). For example, in an investigation of smokers' perceptions of smoking-related risks at the time of admission to a hospital emergency room with chest pain, Bock and colleagues (Bock, Becker, Niaura,

& Partridge, 2000) found that almost *half* denied that they had a health condition that could be made worse by smoking. Other studies, however, have found a tendency for individuals to *overestimate* smoking-related health risks (Hill & Gray, 1984; Kristiansen, Harding, & Eiser, 1983; Viscusi, 1990, 1992). In a recent review of the accuracy of smokers' risk perceptions, Weinstein (1998) concluded that whether smokers underestimate or overestimate the health risks of smoking depends entirely on how perceptions of risk are measured. In addition, research indicates that perceptions of risk vary substantially from person to person (van der Plight, 1994) and are often only weakly related to objective risk estimates (Weinstein, 1998).

To date, research examining the relationship between risk perceptions and health behavior has focused largely on specific cognitive mechanisms through which individuals may minimize their perceptions of personal risk (e.g., Weinstein, 1980; Gibbons, McGovern, & Lando, 1991). In addition, specific individual difference factors involved in how people may respond to health risk information including coping style (Jacob, Penn, Kulik, & Spieth, 1992; Miller, 1995; Miller & Mangan, 1983), negative affectivity (Mayne, 1999; Vollrath, Knoch, & Cassano, 1999), and self-esteem (Smith, Gerrard, & Gibbons, 1997; Boney-McCoy, Gibbons, & Gerrard, 1999) have been examined. However, very little attention has been directed toward examining potential information processing strategies that may generally impede or facilitate the *initial encoding* of health risk messages. That is, few studies have attempted to identify individual difference factors that may influence motivation to attend to and think carefully about health risk communications. This is surprising given the large body of research indicating that the potential effectiveness of health education campaigns is limited by constraints on

individuals' abilities to accurately process and evaluate risk information (Lee, 1989; Rothman & Schwartz, 1998).

Clearly, there is a need to develop a better understanding of factors that underlie the encoding and cognitive processing of health risk messages. Research directed toward this goal could potentially be of both theoretical and practical importance. From a theoretical perspective, existing models of health behavior which have formed the basis for the development of current health education interventions may need to be expanded or revised. Practically, disseminating better health risk messages to the public may help to foster a more complete and integrated understanding of the health risks associated with unhealthy behaviors. This, in turn, may serve to more strongly motivate individuals to adopt important health behavior changes. Therefore, the purpose of this study was to investigate specific information processing factors that might influence the motivation to attend to and deliberatively process smoking health risk information.

Need for Cognition (NC) and the Elaboration Likelihood Model of Persuasion

One potential source of variability in how risk information is encoded and processed may stem from stable individual differences in the preference for engaging in and enjoying (or avoiding and disliking) relatively effortful cognitive processing of information in general. That is, the degree to which individuals are likely to attend to and to cognitively elaborate health risk messages may vary, in part, as a function of an intrinsic motivation to process information in general. Petty and Cacioppo's construct of *need for cognition*, a component of the Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1986), offers a theoretical context from which to systematically examine how

individual differences in motivation to engage in elaborative thinking may moderate the potential impact of health risk messages.

As defined by Petty and Cacioppo (1982), the need for cognition (NC) refers to "a stable individual difference in people's tendency to engage in and enjoy effortful cognitive activity." Individuals high in NC are proposed to exhibit a dispositional tendency to search for, gather, scrutinize, and reflect back on information in an effort to comprehend their world. In contrast, individuals low in NC are proposed to rely primarily on the opinions of credible others, judgmental heuristics, and social comparisons in an effort to structure their world. In addition, individuals high in NC are proposed to prefer tasks that require greater cognitive effort (e.g., reading, complex problem solving), while individuals low in NC are thought to prefer endeavors demanding fewer cognitive resources (e.g., sports, pets; Cacioppo et al., 1996).

Within the framework of the ELM (Petty & Cacioppo, 1986), the degree to which individuals are motivated and able to process a persuasive message determines how carefully the central merits of the message will be considered and evaluated. Central to the ELM is the notion that individuals are fundamentally motivated to hold attitudes that are correct. The amount of time and cognitive resources individuals have available to devote to information processing, however, are inherently limited. Therefore, individual and situational factors are proposed to influence the degree to which people are motivated and able to engage in issue-relevant processing required to adequately evaluate the merits of a persuasive message. Accordingly, the amount of cognitive effort that people actually devote to ensuring the correctness of their attitudes varies considerably.

Examples of *situational* factors that may influence degree of cognitively effortful processing include repetition of and distraction from a message. Specifically, repetition of a message is likely to increase the probability that an individual will attend to, comprehend, and remember information whereas distraction is likely to disrupt processing of a message (particularly when motivation and ability to engage in effortful processing are high). NC represents an important *individual* difference factor that should theoretically influence motivation to engage in elaborative information processing in general. That is, individuals higher in NC are more likely to carefully and deliberately process the content of persuasive messages whereas individuals lower in NC are likely to devote relatively fewer cognitive resources to message processing. This perspective stands in contrast to other influential models of attitude change (e.g., the Theories of Reasoned Action and Planned Behavior), which presume that people generally make an effort to carefully evaluate persuasive information (Petty and Cacioppo, 1981).

The ELM (Petty and Cacioppo; 1986) holds that the degree to which individuals are willing and/or capable of engaging in cognitive elaboration of persuasive messages can be generally conceptualized on a continuum. However, two theoretically and qualitatively distinct routes to persuasion are theorized to operate at opposite ends of the continuum, the central route and the peripheral route. The central route to persuasion operates when individuals are highly motivated and able to scrutinize issue-relevant components of persuasive messages. The peripheral route operates when individuals are relatively less motivated and able to process issue-relevant components of a message and are, therefore, forced to rely on peripheral cues (e.g., attractiveness or credibility of the message source) in order to evaluate a message. Therefore, processing messages via the

peripheral (vs. central) route may allow for changes in attitudes without having carefully evaluated a message's central components. Considerable theoretical and empirical research supports that messages processed via the central (vs. peripheral) route are more persistent and better predict future behavior (see Cacioppo et al, 1996 for a review; Heesacker, 1986). However, the peripheral route may serve as a potential mechanism of attitude change when the likelihood of message elaboration is low (Petty & Cacioppo, 1986).

As alluded to earlier, individuals high in NC are more likely to engage in central processing of information whereas individuals low in NC are more likely to follow the peripheral route to persuasion. Consistent with this, individuals high (vs. low) in NC have been found to better recall the content of persuasive messages (Cacioppo et al., 1986) and to be more influenced by the quality of persuasive arguments (Ahlering, 1987; Cacioppo, Petty, & Morris, 1983; Cacioppo, Petty, Kao, & Rodriguez, 1986; Smith & Petty, 1996). Therefore, NC should theoretically represent a stable individual difference dimension along which people vary in terms of a general motivation to deliberately process health risk information. That previous research has documented considerable inter-individual variability in perceptions of smoking health risks (e.g., van der Pligt, 1994) is consistent with this possibility. Moreover, the ELM predicts that the NC should exert a more powerful influence over degree of cognitively effortful processing compared to transient situational factors (Petty & Cacioppo, 1986; Cacioppo et al., 1996).

Relationship between NC and Other Individual Difference Variables

As stated above, NC reflects one's motivation to engage in cognitively effortful information processing rather than intellectual ability. However, NC is has been found to

be modestly correlated with verbal intelligence (meta-analysis $r_{ave}=.24$, $p<.01$; Cacioppo et al., 1983, 1986) as well as high school ($r=.26$, $p<.01$; Petty & Jarvis, 1996) and college grade point average (meta-analysis $r_{ave}=.17$, $p<.01$; Cacioppo & Petty, 1984; Petty & Jarvis, 1996; Tolentino, Curry, & Leak, 1990; Waters & Zakrajsek, 1990). NC is also correlated with education (meta-analysis $r_{ave}=.25$, $p<.001$; Davis, Severy, Kraus, & Whitaker, 1993; Tanaka, Panter, & Winborne, 1988; Spotts, 1994). NC does not appear to be related to emotionality (Thompson & Zanna, 1995). NC is modestly and positively related to introspectiveness ($r=.16$, $p<.05$; Berzonsky & Sullivan) and openness to experience (Costa & McCrae, 1978; actions subscale $r=.39$, $p<.01$, feelings subscale $r=.31$, $p<.01$, ideas subscale $r=.78$, $p<.01$, values subscale $r=.29$, $p<.01$; Berzonsky & Sullivan, 1992). Please see Cacioppo et al., (1996) for a complete review of individual difference variables related to NC.

NC, Message Content, and the Construction of Risk Perceptions

As described earlier, the degree to which people are motivated to process complex health risk messages should vary as a function of NC. Recently, there has been an emphasis in health education on simplifying the content of written messages in an effort to reach a wider audience (Reid et al., 1995; Meade & Byrd, 1989). However, a number of studies have indicated that certain groups of individuals appear to benefit substantially more from relatively complex health risk messages, while others are more strongly influenced by less complex messages (e.g., Connelly & Knuth, 1998; Dowe, Lawrence, Carlson, & Keyserling, 1997). Therefore, it is important to examine whether matching the *content* of health risk messages to individuals' intrinsic preferences for information processing might encourage individuals to attend to and elaborate smoking health risk

messages. If successful, such matching could potentially facilitate among smokers a better understanding of the true risks of smoking and the benefits of quitting.

Based on the ELM, it would be expected that individuals higher in NC prefer more complex, detailed health risk messages requiring greater cognitive effort to process and that individuals lower in NC prefer to process messages that demand fewer cognitive resources. Because individuals higher in NC are intrinsically motivated to engage in elaborative processing of information, they might perceive little value in allocating cognitive resources to evaluating messages that discourage extensive thinking. From their perspective, such messages might lack credibility or validity. On the other hand, individuals lower in NC might choose to cease the processing of relatively complex and detailed messages once they realize that a high level of cognitive effort will be required. On the other hand, these individuals might be more willing to allocate cognitive resources to messages that appear to require less effort. Therefore, it was predicted that the *content* of health risk messages might interact with NC to facilitate or attenuate the likelihood that the information would be attended to and carefully processed.

Message Variables Found to Interact with NC to Influence Persuasion

Given that NC has demonstrated a reliable association with the degree to which persuasive messages are attended to and processed, increasing attention has been directed toward investigating specific details that define the content of persuasive messages and how they may ultimately influence persuasion. Several of these factors are reviewed below.

NC and argument quality. Among the first studies to manipulate the information included within persuasive messages were those that examined the influence of the

quality (i.e., strong vs. weak message) of persuasive arguments. Specifically, these studies investigated the hypothesis that level of NC (high vs. low) would differentially impact the importance of message quality in predicting attitude changes. Theoretically, because individuals higher in NC spend more time thinking about and elaborating messages, it was expected that greater attitude change would occur following exposure to high quality (i.e., strong) compared to low quality (i.e., weak) messages among these individuals. Conversely, because individuals lower in NC devote relatively fewer cognitive resources to message processing, they were expected to show little discrimination between the two types of messages.

In an initial investigation of the relationship between NC and argument quality, Cacioppo et al. (1983) assigned participants high or low in NC (based on scoring within the top or bottom third of the sample) to read either a strong (i.e., high quality) or weak (i.e., low quality) message in support of the possible institution of comprehensive exams at their university. Strong arguments were defined as those that elicited primarily favorable thoughts when participants were instructed to think about the message (e.g., "The average starting salaries of graduates are likely to be an average of over \$4000 higher following the institution of comprehensive exams."; Petty & Cacioppo, 1986). Weak arguments were defined as those that elicited predominantly *unfavorable* thoughts, although written to appear to be in favor of the position (e.g., "Over half of the students surveyed at this university are in favor of comprehensive exams."; Petty & Cacioppo, 1986). Results indicated that the quality of arguments influenced post-message evaluations as well as the trustworthiness and expertise of the message source to a greater degree for high NC participants than for low NC participants. In a second experiment

(Cacioppo et al., 1983, Study 2), the authors replicated the findings of the first experiment using strong and weak arguments advocating for an increase in student tuition. They also found that argument quality influenced post-message attitudes to a greater degree for participants higher versus lower in NC.

Since the initial study, numerous investigations of the degree to which NC moderates attention to argument quality have been conducted. Most have been based on the standard operational definition of argument quality used in the initial study conducted by Cacioppo and colleagues (1983). Specifically, subsequent studies tested the hypothesis that attitudes would be influenced to a greater degree by the quality of arguments (i.e., strong vs. weak) when the likelihood of message elaboration was high (i.e., participants were higher in NC). When the likelihood of elaboration was low (i.e., participants were lower in NC), the quality of the message was expected to have little effect (Cacioppo et al., 1996).

Overall, these studies have yielded results consistent with the idea that NC moderates the relationship between message quality and post-communication attitudes (e.g., Ahlering, 1987; Baron, Lilly, Inman, & Brennan, 1994; Cacioppo, Petty, Kao, & Rodriguez, 1986, Study 1; Cacioppo, Petty, & Morris, 1983, Study 2; Haugtvedt, Petty, & Cacioppo, 1992, Studies 1 and 2; Inman, McAlister, & Hoyer, 1990; Petty & Wegner, 1998, Study 2; Priester & Petty, 1995, Study 2; Smith & Petty, 1996, Study 2). It is worth noting, however, that a few studies have failed to find the expected NC x argument quality interaction (e.g., Axsom, Yates, & Chaiken, 1987; Petty, Schumann, Richman, & Strathman, 1993, Study 1; Priester & Petty, 1995, Study 3). The authors of one of these studies (i.e., Axsom et al., 1987) speculated that the expected interaction may have failed

to emerge because participants might have been more involved compared to participants in previous studies, facilitating more systematic processing among all participants. Petty and colleagues (1993) reported that the messages they used were neither "unambiguously" strong nor weak, which may have attenuated their findings. In an effort to quantify the overall magnitude and significance of the relationship between NC and argument quality, Cacioppo et al. (1996) conducted a meta-analysis of 11 experiments (nine published studies) that investigated the interaction. Results of the analysis indicated the relationship to be of small to medium magnitude (Rosenthal & Rosnow, 1984, p. 361) and reliable ($d=.312$, $p<.001$).

NC and message framing. The framing postulate of Kahneman and Tversky's (1979) prospect theory posits that people typically prefer risky outcomes when decision problems are framed in terms of potential losses and are risk averse when problems are framed in terms of potential gains. Consistent with this, the postulate holds that choice preferences can be systematically reversed as a result of changing the frame of a problem. That is, simply changing the content of a message to reflect the flip-side of a given outcome (e.g., number of lives that will be saved vs. lost as a result of medical treatment) has been demonstrated to completely reverse decision outcomes, despite the equivalence of the messages. To date, several studies have investigated NC as a potential moderator of framing effects.

In a series of two studies, Smith and Levin (1996) examined the hypothesis that individuals lower in NC would be influenced by framing effects to a greater degree than would individuals higher in NC. More specifically, this hypothesis was based on the theoretical rationale that people who are generally less (vs. more) inclined to extensively

process the key components of a message (i.e., individuals low in NC) may be influenced to a greater degree by peripheral cues such as the frame of a message. In the first study to test this hypothesis (i.e., Smith & Levin, 1996, Study 1), undergraduate psychology majors who were high or low in NC (based on a median split) were instructed to read one of two framed messages. One of the messages instructed participants to imagine that they had arrived to see a show to discover they had lost their ticket valued at \$25 (ticket frame). The other message instructed them to imagine they had arrived to see the show to discover that they had lost \$25 (money frame). Following each scenario, participants were asked whether they would spend \$25 to replace the ticket (ticket frame) or purchase a ticket (money frame). Results indicated that participants low (vs. high) in NC were strongly influenced by the framing of the scenario. Whereas two-thirds of the low NC participants indicated that they would purchase a ticket in response to the money frame, only slightly more than one-third reported that they would purchase a ticket in response to the ticket frame. In contrast, nearly equal proportions of high NC participants indicated that they would purchase a ticket in response to each frame.

The second study (i.e., Smith & Levin, 1996, Study 2) was intended to replicate the results of the first study using a different choice problem. Consistent with the procedure employed in the first study, the authors assigned psychology majors who were high or low in NC (based on a median split) to read one of two different framed messages. Participants were asked to imagine that they had been diagnosed with a rare form of cancer with two known treatments (i.e., surgery and radiation therapy) and then asked to evaluate a message framed in terms of either typical survival or mortality rates associated with each type of treatment. The "survival frame" emphasized the number of

people who generally live through each treatment and the number who remain alive at one year and five years post-treatment. The "mortality frame" emphasized the number of people who generally die during treatment and the number who die by one year and five years post-treatment. Consistent with hypotheses and with the first study, results indicated that participants low in NC were more strongly influenced by framing of the message than were participants high in NC. Specifically, one-third of low NC participants preferred radiation therapy when it was presented in the survival frame but over 70% opted for radiation when the message was presented in the mortality frame. In contrast, high NC participants' preferences were not influenced by frame of the message. Specifically, nearly equal proportions opted for radiation therapy under each framing condition.

Zhang and Buda (1999) investigated the joint influence of NC and positive (i.e., emphasizing advantages) versus negative (i.e., emphasizing disadvantages) message frames on responses to persuasive messages. More specifically, the study predicted that people lower in NC would be more likely to be persuaded by positively (vs. negatively) framed messages and that people higher in NC should be less influenced by message framing in general, as these individuals should recognize the equivalence of both messages. Undergraduate students high or low in NC (based on the top and bottom thirds of the sample) were assigned to read either a positively or negatively framed advertising message about a new personal stereo receiver. In addition, credibility of the message source was manipulated by telling half of participants that an expert had evaluated the product (high credibility) and the other half that shoppers had evaluated the product (low credibility). Consistent with hypotheses, results indicated that participants low (vs. high)

in NC reported the product to be significantly more attractive, indicated that they would be more willing to purchase the product, and reported a higher level of perceived performance in response to the positive (vs. negative) message frame. Conversely, no significant differences emerged for participants high in NC on any of the three outcome measures. In addition, participants low (vs. high) in NC rated the product significantly less favorably in response to the negative message frame.

NC and factual versus evaluative message content. The *factual* versus *evaluative* orientation of a persuasive communication provides a theoretically based dimension along which the complexity of persuasive messages may be manipulated. As defined by Holbrook (1978), factual messages are those in which the content of the message is "logical and objectively verifiable" and evaluative messages are those in which the content is "emotional and subjective." Presumably, factual messages require more extensive and effortful information processing strategies whereas evaluative messages require less thoughtful deliberation to process. In the area of marketing research, several studies have found that message complexity (i.e., factual vs. evaluative) moderates the relationship between NC and responses to persuasive messages.

In a 2 (high vs. low NC) x 2 (factual vs. evaluative message) design, Venkatraman and colleagues (1990a) investigated the hypothesis that individuals who differed in the dispositional tendency to enjoy thinking (i.e., NC) would be either more or less responsive to different types of persuasive advertising messages. The authors presented undergraduate students high or low in NC with either a factual or evaluative message about the merits of a fictitious car. Specifically, they tested the hypothesis that participants higher in NC would be influenced to a greater degree by the factual message

whereas individuals lower in NC would be more strongly influenced by the evaluative message. Results indicated that higher NC was associated with significantly greater persuasion following exposure to the factual (vs. evaluative) message. However, NC was *not* found to moderate the persuasiveness of the evaluative message. That is, participants both high and low in NC failed to differ in terms of the degree to which they perceived the evaluative message as persuasive.

Several possible explanations for this pattern of findings are worth considering. It is possible that participants lower (vs. higher) in NC simply failed to attend to the content of *either* message based on prior knowledge that written messages generally require some degree of cognitive work to process and evaluate. That is, it may have been that low NC participants immediately disengaged from message processing in response to the written format of both messages. If this is the case, it is likely that both the factual and evaluative messages were perceived as similarly difficult to evaluate on the part of low NC participants, thereby reducing the motivation to process the messages at all. Therefore, it is important to investigate potential ways to encourage message processing among low NC individuals. For example, augmenting evaluative messages with visual details (e.g., drawings, pictures, simple visual displays) may create the impression that a message required fewer cognitive resources to process.

In a second study that investigated the joint influence of NC and factual vs. evaluative messages on persuasion, Venkatraman and colleagues (1990b) again found that individuals high (vs. low) in NC displayed a greater preference for factual vs. evaluative information regarding the merits of a fictitious car. In addition, they investigated whether NC would influence preferences for verbal compared to visual

information. Results indicated that individuals high (vs. low) in NC demonstrated a preference for verbally presented information, although no differences in preferences for visual information emerged as a function of NC (Venkatraman et al., 1990b, as reported by Cacioppo et al., 1996). It is important to note that neither message actually contained visual information in this study. Rather, preferences for verbal versus visual information (Childers, Houston, & Heckler, 1985) were established via responses to a self-report measure and correlations between this construct and NC were reported.

NC, Other Message Variables, and Health Behavior

More recently, the construct of NC has been investigated within the scope of persuasive health communications. Reid and colleagues (1995) examined text and reader characteristics that might influence diabetes patients' comprehension and retention of written information presented in a widely distributed diabetes pamphlet. Findings indicated that higher NC was associated with greater recall of information. Bakker (1999) investigated the relationship between NC and the format of printed AIDS prevention messages (i.e., cartoon format vs. written format) on adolescents' knowledge, attitudes, and subjective norms regarding AIDS risk behavior. The cartoon format reflected a light and humorous tone and the written format contained concise, written information. Both formats included basic information about AIDS and other STDs as well as the importance of consistent condom use. In addition, a no-message control group was included within the study. Results indicated that both message formats positively influenced knowledge and attitudes in comparison to the no-message control group. Although the NC x message format interaction failed to reach significance, differences in reported knowledge of AIDS preventive and protective behaviors among

adolescents high and low in NC were in the expected direction. However, a crossover interaction emerged between NC (high vs. low) and message format (cartoon vs. written) for attitudes. Specifically, adolescents higher in NC reported more positive attitudes toward condom use and stronger subjective norms after exposure to a written (vs. cartoon) message whereas the opposite pattern emerged for individuals lower in NC. Both message conditions reported more favorable attitudes in comparison to the control group.

The Present Study

In summary, the ELM posits that the relatively stable dispositional construct of NC should generally moderate the likelihood that messages will be processed via the central versus peripheral route to persuasion. Consistent with this theoretical prediction, NC might influence preferences for relatively fact-based (i.e., factual) versus emotion-based (i.e., evaluative) messages. As reviewed earlier, a few studies have found that NC predicts the degree to which individuals are likely to be persuaded by different types of message content (Venkatraman et al., 1990a, 1990b) or format (Bakker, 1999). However, research examining the influence of NC on the motivation to attend to and deliberately process persuasive messages has only recently been extended to the area of health risk. To date, only one study has tested for a potential interaction between NC and format of risk message (i.e., Bakker, 1999), and this study produced significant results. No studies have investigated the potential joint influence of message factors and NC in the area of smoking. This study was intended to examine how smokers' stable, intrinsic preferences for information processing might influence attention to and processing of smoking health risk messages.

The primary hypothesis of this study was that NC would moderate the influence of factual versus evaluative content of smoking health risk messages. The evaluative messages were augmented with pictures in an effort to make them appear less effortful to process and comprehend. This change was expected to facilitate processing of the evaluative message among individuals lower in NC and was intended to address problems related to the failure of Venkatraman and colleagues (1990a, 1990b, described earlier) to find the predicted crossover interaction between NC and factual vs. evaluative message content.

The effect of the messages on smoking-relevant health risk perceptions was of primary interest. Specifically, it was hypothesized that there would be an interaction between pamphlet type (factual versus evaluative) and participants' levels of NC on self-reported risk perception. That is, the impact of the factual pamphlet on risk perception was expected to be positively related to level of NC whereas the impact of the evaluative pamphlet was expected to be negatively related to level of NC. A more specific goal was to examine whether the predicted interactions would have equivalent or differential effects for lighter (i.e., occasional) and heavier (i.e., daily) smokers. We did not have strong hypotheses concerning which group of smokers might be most influenced by matching of the messages to NC. On one hand, it was thought that the predicted effects might be most potent among lighter (i.e., occasional) smokers because their smoking is likely to be more malleable due to shorter smoking histories and lower levels of nicotine dependence. Because lighter smokers are presumably less entrenched in their smoking behavior, it was expected that this group would find it more difficult to counteract the risk message and would be more likely to acknowledge risk due to more poorly

developed cognitive dissonance reduction strategies (Halpern, 1994; Jenks, 1992; McMaster & Lee, 1991). On the other hand, it was thought that heavier (i.e., daily) smokers might perceive the messages as more personally relevant because they are objectively at greater risk compared to lighter smokers. Theoretically, greater perceived personal relevance of a message should facilitate processing (Petty & Cacioppo, 1986). However, given their smoking histories, heavier smokers would be expected to have been exposed to a greater number of smoking risk messages over a longer period of time, which might make such messages easier to discount.

A second goal of the study was to examine potential mechanisms through which the predicted changes in risk perception might occur. It was, therefore, hypothesized that the same interactions predicted for risk perception would emerge for smokers' evaluations of the content of the pamphlets and for pamphlet-relevant knowledge. A third goal was to test whether NC and message type would interact to influence smokers' behavioral expectations of changing their behavior to reduce their risk of developing a smoking-related health condition. In formulating the third hypotheses, we expected that the likelihood that brief exposure to a smoking risk pamphlet would have a measurable impact on changing expectations of reducing risk or actual smoking behavior would be small (see page 29 for an explanation of why we assessed behavioral expectations rather than behavioral intentions). Public health campaigns attempting to influence smoking typically deliver numerous types of smoking risk messages on multiple occasions over an extended period of time and the effects are often small. Project COMMIT (Community Intervention Trial for Smoking Cessation), a massive, four-year, multi-city trial targeting smoking had little effect on cessation rates and the effects that did emerge were modest

and affected only light to moderate smokers; the intervention had no effect on heavy smokers (The COMMIT Research Group, 1995). Therefore, it was not expected that a seven-minute exposure to a single smoking risk pamphlet would significantly influence expectations of changing smoking behavior post-pamphlet or actual behavior at follow-up.

In addition, the joint influence of NC and message type was examined at one-month follow-up for the following outcomes: 1) risk perception, 2) knowledge of the health risks of smoking, and 3) actual changes in smoking behavior. The same hypotheses were examined for risk perception as well as for the other two outcomes, pamphlet-relevant knowledge and changes in actual smoking at one-month follow-up. Again, although we did not have strong hypotheses that brief exposure to a smoking risk pamphlet would influence smoking behavior one month following participation in the study, we thought this possibility was worth examining.

Chapter 2

Methods

Design and Overview

The purpose of this study was to examine whether individual differences in NC interacted with different types of risk messages to influence perceptions of smoking-relevant risk. Moreover, a larger goal was to examine whether the predicted interactions would have equivalent or differential effects for lighter (i.e., occasional) and heavier (i.e., daily) smokers. A secondary purpose of the study was to examine potential mechanisms through which changes in risk perception might occur within both groups of smokers (i.e., pamphlet evaluation ratings and pamphlet-relevant knowledge). Although our expectations that brief exposure to smoking risk messages would influence plans to actually adopt risk-reducing behaviors were low, we also examined this relationship. In addition, the potential joint influence of NC and message type on risk perception, knowledge retention, and actual smoking behavior change at follow-up were examined. Participants randomized to the control condition were expected to report lower levels of perceived risk, less knowledge of smoking health risks presented in the two smoking risk pamphlets, and weaker behavioral expectations for changing their smoking behavior.

Participants were asked to complete the 18-item short form of the Need for Cognition Scale (NCS; Cacioppo et al., 1984), a brief demographic questionnaire, a smoking status and history questionnaire, a brief measure of message-relevant risk

perceptions, and a measure of social desirability. Rather than dichotomizing levels of NC as has traditionally been done within this literature, NC scores were left continuous. This approach was expected to increase power to detect an effect (see Cohen, 1983 for a discussion of the consequences of dichotomizing continuous variables). Next, participants were randomly assigned to read a pamphlet containing either factual or evaluative information concerning relatively unfamiliar smoking-related health risks or a control pamphlet on foodborne illness. Unfamiliar smoking risk information was used in an effort to assess how participants would respond to and process novel risk information. After reading their assigned pamphlet, participants evaluated the information and responded to measures assessing their knowledge of information therein, perceptions of personal risk, and expectations of taking action to reduce their smoking-related health risks. One month after participating in the experiment, all smokers were asked to respond via telephone to follow-up measures of pamphlet-relevant knowledge, risk perceptions, and smoking-related behavior changes.

Participants

Participants were college student smokers recruited from undergraduate psychology courses at the University of South Florida. Although we were primarily interested in smokers' responses, we collected additional data from nonsmokers. This allowed us to recruit from the general college student population. Data provided by nonsmokers will be used at a later time to examine several hypotheses outside the immediate scope of the present study. Smokers were defined as individuals who report smoking at *any* point during the month prior to their participation in the study. Inclusion

criteria for this study required that participants be enrolled at the University of South Florida, be at least 18 years of age, and speak English.

Materials and Measures

Factual and evaluative smoking risk pamphlets. The factual and the evaluative pamphlets described specific health risks associated with smoking assumed to be less well-known than more publicized health consequences of smoking (e.g., lung cancer, emphysema). Specifically, both pamphlets described how smoking increases the risk of skin cancer, ulcers, chronic heartburn, decreased liver function, heart disease, stroke, osteoporosis, Crohn's disease, Buerger's disease, gum disease, cervical cancer, brain aneurysm, impotence, reduced sexual desire and satisfaction, and fertility problems. The factual pamphlet described each health risk associated with smoking using logical, well-documented, and objectively verifiable information (e.g., "A recent study published in the journal of Community Dentistry and Oral Epidemiology indicates that teenagers who smoke are three times more likely than those who don't to develop gum disease [leading to tooth loss] in their mid 20's. The study results were based on longitudinal reports of 914 subjects' smoking histories at the ages of 15, 18, 21, and 26."). On the other hand, the evaluative pamphlet described the risks in terms of emotional, impressionistic, and subjective statements (e.g., "Teenagers who smoke are at much higher risk of developing gum disease compared to those who don't smoke. By the time these individuals reach their mid-20's, they have often permanently damaged their teeth and gums without knowing it. Smokers who suffer from gum disease eventually lose many of their teeth and must endure several painful dental visits."). Both pamphlets described 16 identical potential health consequences of smoking. In addition, each of the 16 message pairs were

equated for length (i.e., each factual message was required to be no more than five letters shorter or longer than its matched evaluative message).

Control pamphlet. A control condition was included to allow for examination of the influence of the smoking risk messages on perceptions of risk relative to the effects of a non-smoking related message. One-third of participants were randomized to receive the control pamphlet that did not discuss smoking. Because the pamphlet was unrelated to smoking, no attempt was made to assess the degree to which the messages were perceived as factual vs. evaluative. Rather, the messages in the control pamphlet were comprised of both factual and evaluative content. The control pamphlet described the topic of foodborne illness (i.e., food poisoning). Specifically, the pamphlet described the causes and symptoms of foodborne illness, ways to prevent it, and what to do if a person believes s/he has been exposed. Consistent with the two smoking health risk pamphlets, the control pamphlet contained 16 bulleted points that were each equated for length with the smoking risk pamphlets.

Demographic information. Participants reported demographic information including age, year in school, academic major, current GPA, marital status, and ethnicity.

Smoking status and history. Information about participants' smoking status and smoking history was collected. Levels of nicotine dependence were assessed using the Fagerström Test for Nicotine Dependence (FTND), a scale which has demonstrated acceptable reliability and validity (Heatherton, Kozlowski, Frecker, & Fagerström, 1991).

Balanced Inventory of Desirable Responding (Version 6 - Form 40A). The BIDR Version 6 - Form 40A (Paulhus, 1984, 1991) was administered to assess the degree to which participants' evaluations of the messages, perceptions of pamphlet-relevant risk,

and expectations of adopting risk-reducing behaviors might be influenced by their desire to manage the impressions they make.

Need for cognition. Levels of NC were measured using the 18-item short form of the Need for Cognition Scale (NCS; Cacioppo et al., 1984). Examples of items included on this scale include, *I would prefer simple to complex problems, I would rather do something that requires little thought than something that is sure to challenge my thinking abilities, I feel relief rather than satisfaction after completing a task that required a lot of mental effort, and It's enough for me that something gets the job done; I don't care how or why it works.* This version of the NC scale has demonstrated good internal consistency (e.g., $\alpha=.91$, Berzonsky & Sullivan; $\alpha=.90$, Cacioppo, Petty, & Kao, 1984; $\alpha=.87$, Kernis, Grannemann, & Barlay, 1992). Moreover, the psychometric properties of this scale are very similar to those of the original 34-item version (see Cacioppo et al., 1996 for a review).

Smoking-relevant knowledge. The extent to which participants processed novel information about smoking health risks was assessed with a post-intervention knowledge test comprised of 20 multiple-choice questions drawn from the smoking health risk messages presented in the pamphlets.

Pamphlet evaluation. Participants were asked to evaluate several aspects of the messages included in the pamphlets using a nine-point response scale ranging from "not at all" (1) to "extremely" (9). Specifically, they were asked to evaluate how *convincing, interesting, well-written, believable, coherent, persuasive, and difficult to read* they perceived the messages to be. Items mirrored those employed by Holbrook (1978).

Brief measure of smoking-relevant risk perceptions. Participants responded to a brief, five-item measure of smoking-relevant risk perceptions both prior to and following exposure to the pamphlets. Items assessed perceived general personal risk of developing any smoking-related health condition as a result of smoking as well as specific personal risk for developing gastrointestinal (GI) problems, circulatory diseases, some type of cancer, and fertility or sexual problems. All items assessed perceptions of absolute risk. Items from this measure were analyzed separately, controlling for pre-treatment responses to each item. Each of the items contained in this measure were repeated in the more extensive measure of risk perceptions described below. The four items assessing perceived risk of GI problems (e.g., chronic heartburn, ulcers, Crohn's disease), circulatory diseases (e.g., heart disease, stroke, Buerger's disease), cancer (e.g., skin cancer, cervical cancer), and fertility or sexual problems were combined for analytic purposes to create a four-item scale assessing specific absolute personal risk (described below).

Full measure of smoking-relevant risk perceptions. Weinstein's (1998) review concluded that the most valid and reliable approach to assessing smokers' risk perceptions is to use a variety of assessment strategies. Therefore, participants were also asked to respond to a more extensive, 13-item measure comprised of both absolute and relative (i.e., perceived personal risk compared to other smokers) risk items following exposure to the pamphlets. Items were averaged to reflect three separate and reliable scales: specific absolute personal risk (three items; $\alpha=.90$), absolute risk specific to women (three items; $\alpha=.86$), and relative specific risk compared to other smokers (four items; $\alpha=.94$). Single items were used to assess perceived personal risk of developing

any smoking-related health condition, perceived risk specific to men, and risk of developing at least one health consequence of smoking in terms of percent.

Behavioral expectations. Behavioral intentions have been generally conceptualized as one's *specific plan* to perform a behavior whereas behavioral expectations have been conceptualized as one's *perceived likelihood* of performing a behavior (Warshaw & Davis, 1985). The two constructs are thought to differ qualitatively and different processes are thought to underlie their construction. Specifically, behavioral intention involves making a commitment to perform or not perform a behavior whereas behavioral expectation does not necessarily involve such a commitment. Further, in forming behavioral expectations, individuals are likely to consider a number of *other* factors that may influence their behavior beyond intention (e.g., changes in intention, lack of requisite skills, environmental constraints).

Because behavioral expectations have been shown to offer greater predictive validity than behavioral intentions, the present study assessed *expectations* of adopting risk-reducing behaviors related to smoking. Specifically, three items were used to assess participants' behavioral expectations of adopting these behaviors (e.g., reducing smoking rate, placing restrictions on smoking behavior, quitting smoking) were measured using a nine-point scale ranging from "not at all" (1) to "extremely" (9).

Manipulation check. In order to assess whether participants who received the smoking risk pamphlets perceived the factual pamphlet as fact-based and the evaluative pamphlets as emotion-based, they were asked to complete a manipulation check. Specifically, this questionnaire asked how logical, fact-based, objective, well-documented, emotion-based, subjective, impressionistic, complex, and difficult to process and

understand they perceived the pamphlet to be. All responses were rated on a 9-point scale ranging from "not at all" to "entirely."

Follow-up smoking knowledge measure. One month after completion of the study, participants received a follow-up phone call to assess their retention of pamphlet-related knowledge. Knowledge retention was assessed using a list of 20 health conditions and diseases. Ten reflected those described in the pamphlets and the other ten reflected health conditions *not* described in the pamphlets and participants responded either "yes" or "no" to indicate whether each particular health problem could be caused or made worse by smoking.

Follow-up measure of smoking-relevant risk perceptions. Perceptions of pamphlet-relevant smoking health risks were assessed at follow-up using questions in interview format identical to those that comprised the Brief Measure of Pamphlet-Relevant Risk Perceptions (described above).

Follow-up measure of smoking-related behavior changes. During the follow-up phone interview, participants responded to three questions asking whether they had adopted any behaviors to reduce their smoking-related risk (i.e., reduced number of cigarettes smoked, placed restrictions on smoking, quit completely, or changed their smoking behavior in any way).

Procedure

Participants enrolled in undergraduate psychology courses at the University of South Florida were recruited to participate in the study and were compensated with extra credit points that could be applied to a psychology course they were enrolled in at the time of the study. Participants were informed that the purpose of the study was to

investigate responses to several recently designed health risk pamphlets on various health topics. After expressing interest to participate in the study, individuals were assigned an appointment time to attend an experimental session to be held in a large classroom auditorium within the University. The importance of not conferring with other participants at any point during the experiment was emphasized. After being seated, individuals read and signed an informed consent document. Next, they completed brief questionnaires to assess demographic information, smoking status and history, social desirability, NC, and smoking-relevant risk perceptions.

After completing the baseline questionnaires, participants were randomly assigned to read and evaluate one of the three pamphlets for seven minutes. One of the smoking risk pamphlets contained factual (i.e., logical and objectively verifiable) information and the other contained evaluative (i.e., emotional and subjective) messages. The control pamphlet contained information on foodborne illness. Upon completion of this task, participants responded to several questionnaires designed to assess how they evaluated the message, their pamphlet-relevant risk perceptions, behavioral expectations of adopting risk-reducing behaviors in the future, and pamphlet-relevant knowledge. Participants were then debriefed and thanked for their participation.

Follow-up. One month after participating in the study, all participants received a follow-up phone call to assess their smoking-relevant knowledge retention, risk perceptions, and potential changes in smoking behavior.

Statistical Analysis Overview

Potential differences between the two conditions (factual vs. evaluative) were examined using one-way Analyses of Variance (ANOVAs) and chi-square analyses for

measures collected at baseline: demographic information, smoking status and history, BIDR, brief pamphlet-related risk measure, and NC.

Multiple regression analysis was used to examine the joint effect of NC and message type on each of four dependent variables: 1) smoking-relevant risk perceptions, 2) evaluation of pamphlet content, 3) smoking-relevant knowledge, and 4) behavioral expectations of adopting behaviors to reduce the risks of smoking. It was predicted that interactions between NC and pamphlet type (PT) would emerge for each of the four outcome measures. Multiple regression analyses were also used to determine whether changes in risk perceptions, smoking-relevant knowledge, or smoking behavior were maintained through one-month follow-up. All interactions were plotted using the Aiken and West method (Aiken & West, 1991) and NC values two standard deviations above and below mean ($M=63.29$, $SD=10.76$) were used in the regression equations. Despite the directional nature of our hypotheses, all statistical tests were two-tailed.

Chapter 3

Results

Participant Characteristics

Participants were 227 college student smokers (91 were randomized to the factual condition, 86 to the evaluative condition, and 50 to the control condition) recruited from undergraduate psychology courses at the University of South Florida. All participants were at least 18 years of age and spoke English. Smokers were defined as individuals who reported smoking at least one cigarette at *any* point during the month prior to their participation in the study. For analytic purposes, the sample was divided in terms of daily ($n=101$, 44%) and occasional (i.e., non-daily; $n=126$, 56%) smokers. Demographic and smoking history characteristics are presented in Table 1.

Table 1

Baseline Participant Characteristics

Variable	%	<i>M</i>	<i>SD</i>
Demographics			
Gender			
Female	82		
Male	18		
Age (years)		21.31	4.98
Ethnicity			
Caucasian	75		
Black	7		
Asian	3		
Native American	1		
Other	14		
Hispanic	19		
Marital Status			
Never married	93		
Married	5		
Separated	1		
Divorced	1		
Year in school			
Freshman	27		
Sophomore	19		
Junior	30		
Senior	21		
Other	3		
Academic major			
Psychology	56		
Non-Psychology	44		
GPA			
3.50 to 4.00	24		
3.00 to 3.49	39		
0.00 to 2.99	37		
Smoking History			
Years smoking		5.44	5.23
Daily Smokers	44		
Smoking rate of daily smokers (cigarettes/day)		10.43	6.30
Occasional (non-daily) smokers	56		
Smoking rate of occasional smokers (cigarettes/wk)		2.65	3.74
Need for Cognition (NC)		63.23	10.76
BIDR – Self Deceptive Enhancement (SDE)		6.00	3.13
BIDR – Impression Management (IM)		4.93	3.13

One-way ANOVAs and chi-square analyses indicated that there were no baseline differences across conditions or across different levels of smoking (i.e., daily vs. occasional) on any of these variables or on BIDR scores, NC scores, or levels of perceived risk. Levels of baseline risk perception are presented in Table 2.

Table 2

Baseline Risk Perception

Brief Risk Perception Measure Items	<i>M</i>	<i>SD</i>
How likely are you personally to develop any smoking-related health condition as a result of your smoking?	5.29	1.52
How likely are you personally to develop each of the following health conditions as a result of your smoking?		
Gastrointestinal (GI) problems	4.33	1.79
Circulatory Diseases	4.88	1.74
Some Type of Cancer	5.23	1.66
Fertility and/or Sexual Problems	3.75	1.80

Note. All responses were on a 1 to 7 point scale (1=extremely unlikely; 2=unlikely; 3=somewhat unlikely; 4=neither likely nor unlikely; 5=somewhat likely; 6=likely; 7=extremely likely).

Rates of Smoking for Occasional and Daily Smokers

Occasional smokers. Participants who did *not* smoke daily reported their smoking rate in terms of cigarettes per week. They reported smoking an average of 2.65 (*SD*=3.74) cigarettes per week. The sample size for analyses of daily smokers was *n*=126 (factual *n*=56, evaluative *n*=40, control *n*=30).

Daily smokers. Participants who reported smoking daily smoked an average of 10.43 cigarettes per day (*SD*=6.30). The sample size for analyses of daily smokers was *n*=101 (factual *n*=35, evaluative *n*=46, control *n*=20).

Manipulation Check

Responses to items included in the manipulation check were made on a 9-point scale (1 = not at all, 9=entirely). T-tests indicated that participants did, in fact, perceive the factual pamphlet as significantly more difficult to process and understand ($M=2.26$, $SD=1.74$ vs. $M=1.76$, $SD=1.14$; $p<.05$), well-documented ($M=6.47$, $SD=1.69$ vs. $M=5.30$, $SD=2.21$; $p<.001$), and fact-based ($M=3.88$, $SD=2.06$ vs. $M=4.83$, $SD=1.99$; $p<.01$), than the evaluative pamphlet. As expected, the evaluative pamphlet was perceived as significantly more emotion-based ($M=5.42$, $SD=2.16$ vs. $M=4.23$, $SD=2.08$; $p<.001$), easy to process and understand ($M=7.96$, $SD=1.24$ vs. $M=7.36$, $SD=1.74$; $p<.05$) and graphic ($M=5.84$, $SD=1.95$ vs. $M=5.02$, $SD=2.20$; $p<.05$) than the factual pamphlet. Responses to items assessing the degree to which the pamphlets were perceived as objective, subjective, and complex did not differ across conditions.

Risk Perception Outcomes

Occasional smokers: NC, pamphlet type, and brief risk perception measure. All multiple regression analyses examining the potential joint influence of NC and PT on the brief risk perception measure controlled for baseline levels of perceived risk. Specific outcomes examined included perceived risk of developing any smoking-related health condition and perceived risk of developing gastrointestinal problems, cancer, circulatory diseases, and fertility or sexual problems. A significant interaction emerged between NC and PT to predict perceived risk of developing *any* smoking-related health condition as a result of smoking, $\beta=-.74$, $t=-2.49$, $p<.05$ (see Figure 1). The interaction was in the expected direction for all other outcomes, but only reached significance in predicting gastrointestinal (GI) problems, $\beta=-.65$, $t=-2.39$, $p<.05$ (see Figure 2; circulatory diseases,

$\beta=-.39, t=-1.34, p=.18$; cancer, $\beta=-.42, t=-1.50, p=.14$; fertility or sexual problems, $\beta=-.36, t=-1.33, p=.19$; see Figures 3, 4, and 5, respectively).¹

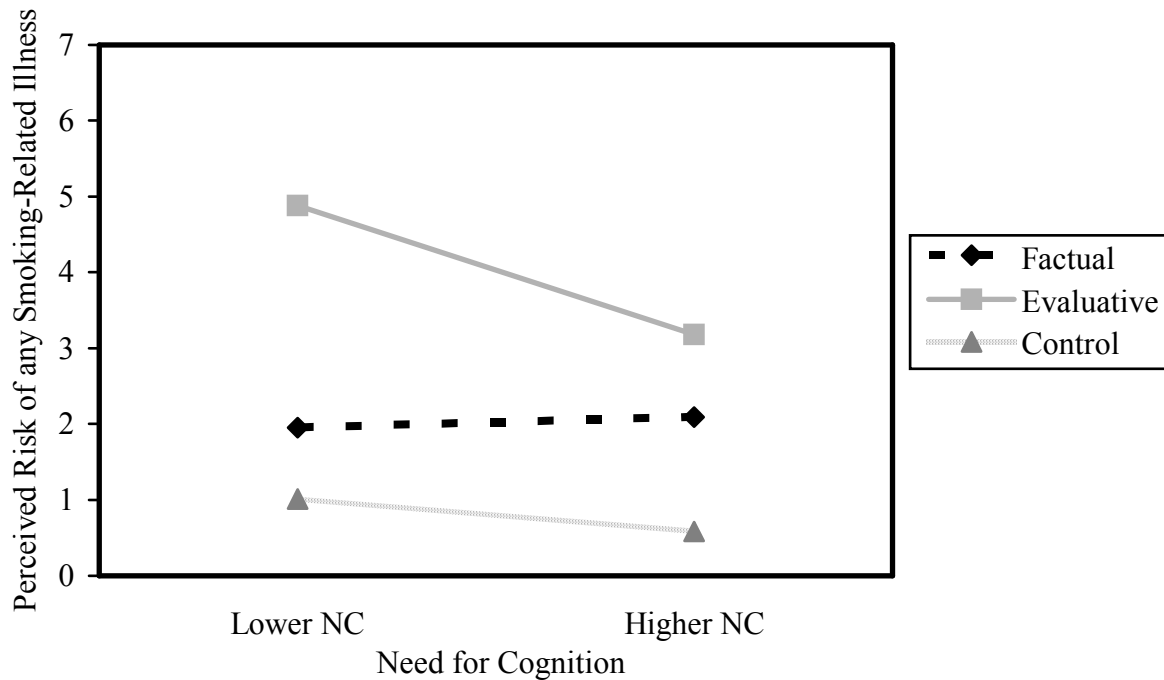


Figure 1. Occasional Smokers: Perceived risk of developing any smoking-related health condition as a result of smoking. *Note.* This analysis controlled for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was significant at the $p<.05$ level.

¹ To investigate whether occasional smokers’ desire to manage the impressions they make might be influencing the NC by PT interactions, we examined the relationship between NC and BIDR scores. NC scores were not significantly correlated with BIDR-SDE ($r=.14, p=.18$) or BIDR – IM ($r=.15, p=.14$) scores, indicating that BIDR scores were unlikely to account for the pattern of observed results.

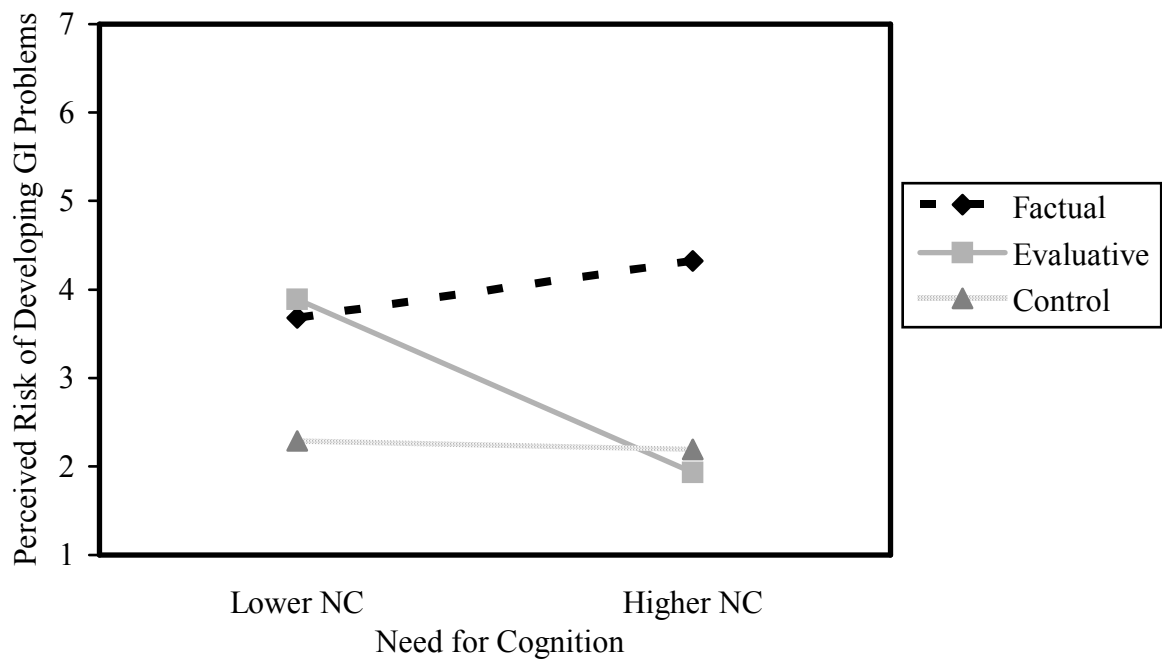


Figure 2. Occasional Smokers: Perceived risk of developing gastrointestinal (GI) problems as a result of smoking. *Note.* This analysis controlled for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was significant at the $p < .05$ level.

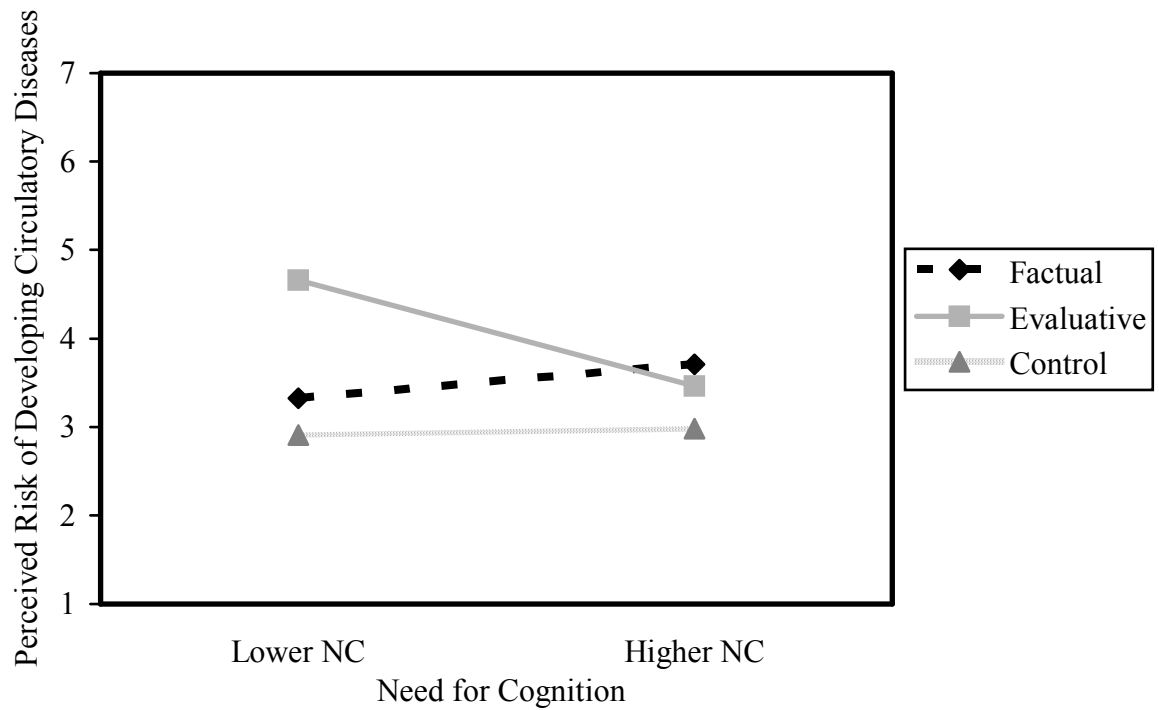


Figure 3. Occasional Smokers: Perceived risk of developing circulatory diseases as a result of smoking. *Note.* This analysis controlled for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was non-significant but in the expected direction, $p=.18$.

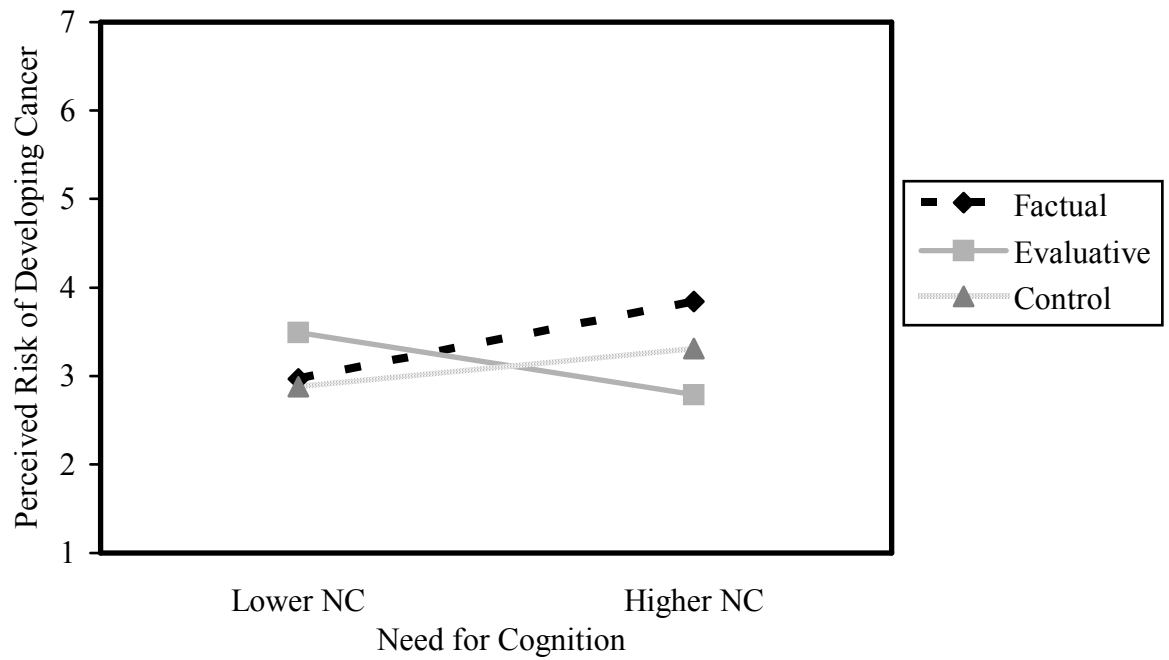


Figure 4. Occasional Smokers: Perceived risk of developing any type of cancer as a result of smoking. *Note.* This analysis controlled for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was non-significant but in the expected direction, $p=.14$.

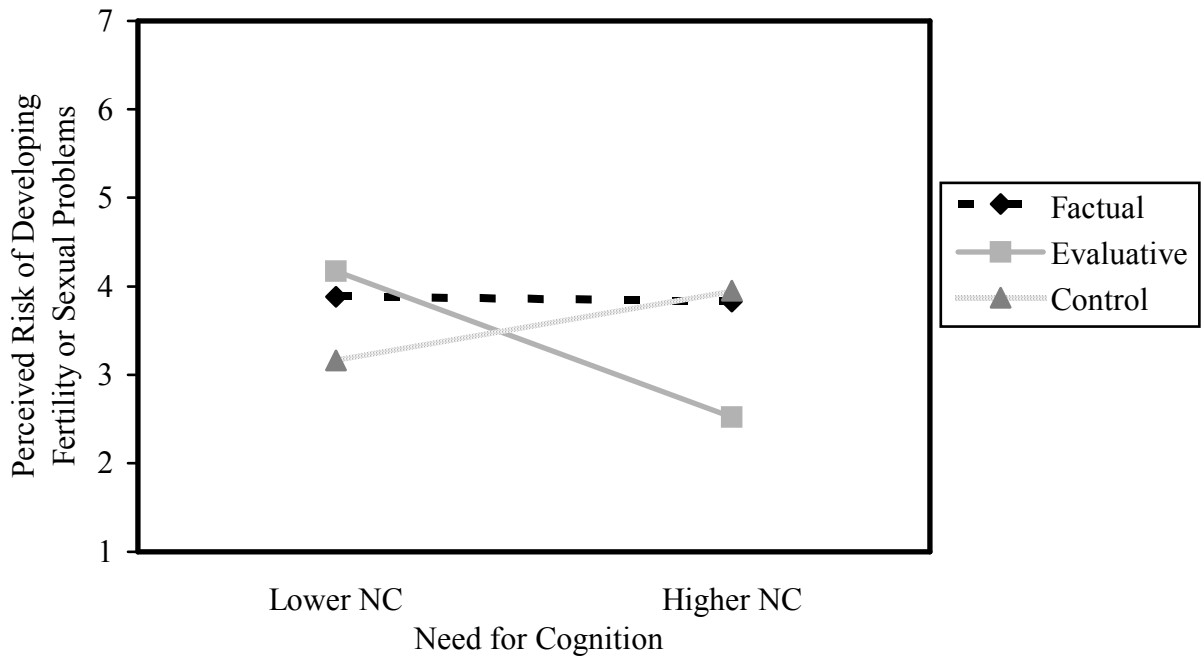


Figure 5. Occasional Smokers: Perceived risk of developing fertility or sexual problems as a result of smoking. Note. This analysis controlled for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was non-significant but in the expected direction, $p=.19$.

Occasional smokers: NC, pamphlet type, and full risk perception measure.

Because the full risk perception measure was given only post-pamphlet, analyses of this measure did not control for baseline levels of perceived risk. As expected, the NC by PT interaction significantly predicted perceptions of absolute specific personal risks of smoking ($\beta=-.69$, $t=-2.13$, $p<.05$), perceived risk relative to other smokers ($\beta=-.74$, $t=-2.30$, $p<.05$), and perceived absolute general risk in terms of percent of developing at least one health consequence of smoking ($\beta=-.75$, $t=-2.35$, $p<.05$). All interactions were

crossover and in the expected direction (see Figures 6, 7, and 8). The interaction was in the expected direction but did not reach significance for either of the other outcomes examined (absolute risk specific to women, $\beta=-.08$, $t=-.21$, $p=.83$; absolute risk specific to men, $\beta=-.70$, $t=-1.05$, $p=.31$; see Figures 9 and 10, respectively).¹

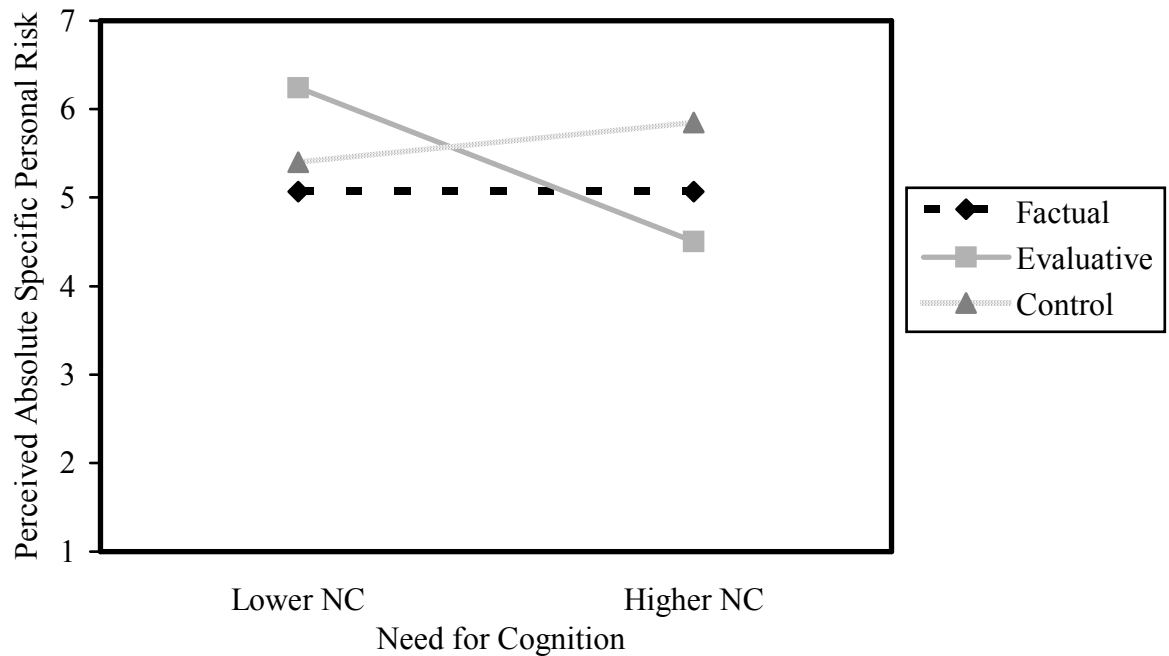


Figure 6. Occasional Smokers: Perceived absolute personal risk of developing specific smoking-related health conditions (i.e., gastrointestinal problems, circulatory diseases, cancer) as a result of smoking. *Note.* This analysis did not control for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was significant at the $p<.05$ level.

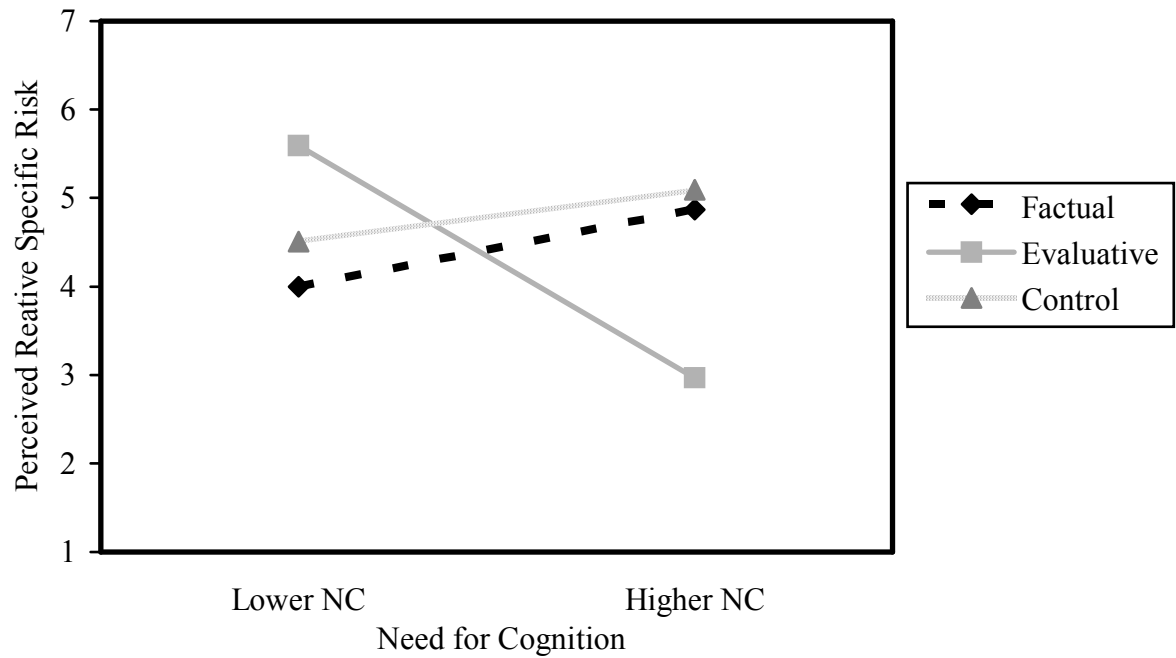


Figure 7. Occasional Smokers: Perceived risk of developing a specific smoking-related health condition (i.e., gastrointestinal problems, circulatory diseases, cancer, gum disease) relative to other smokers. *Note.* This analysis did not control for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was significant at the $p < .05$ level.

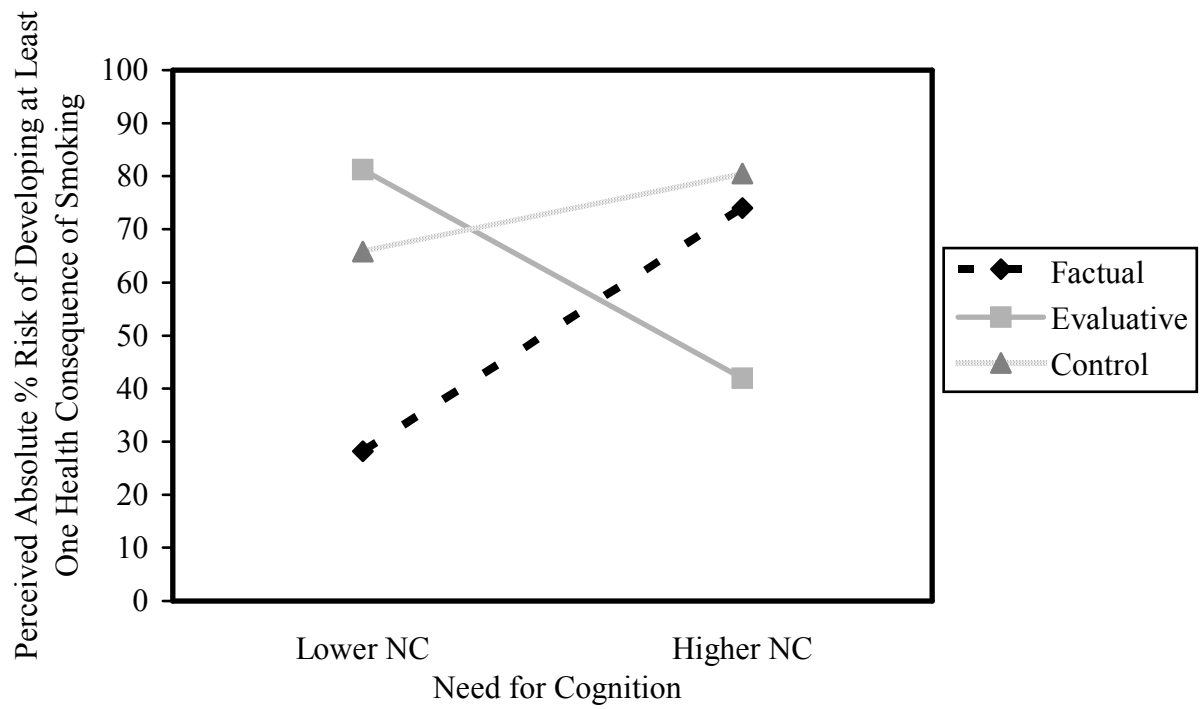


Figure 8. Occasional Smokers: Perceived absolute personal risk in terms of percent of developing any smoking-related health condition. *Note.* This analysis did not control for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was significant at the $p < .05$ level.

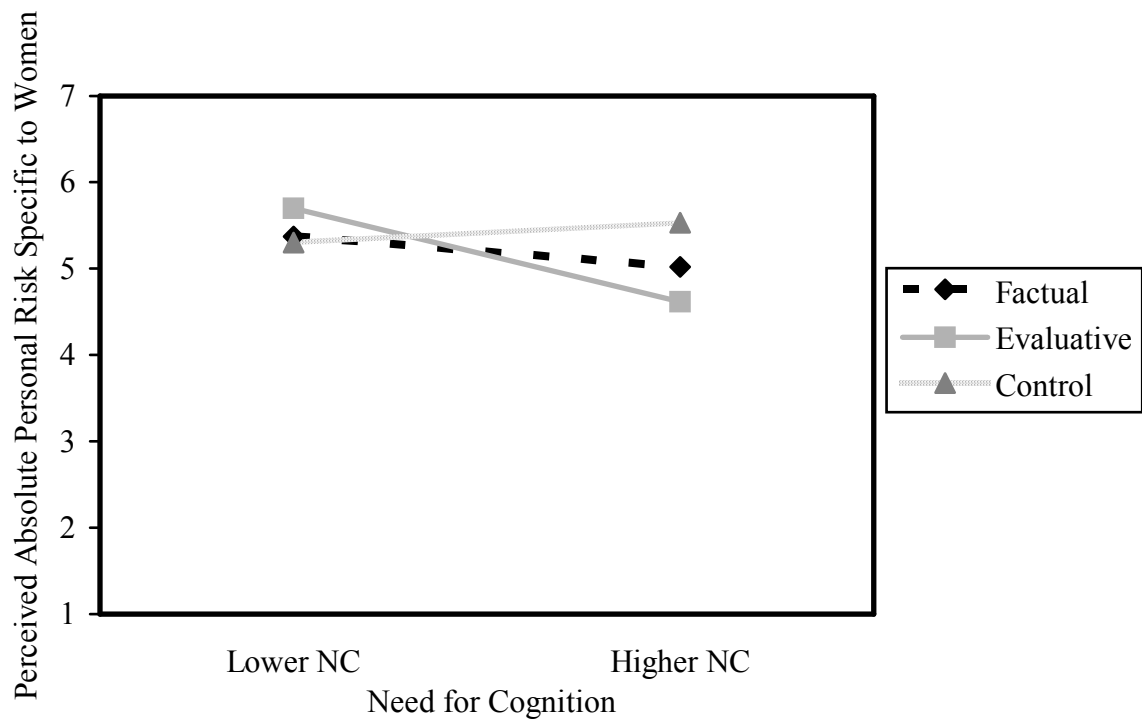


Figure 9. Occasional Smokers: Perceived absolute personal risk specific to women.
Note. This analysis included only women ($n=71$) and did not control for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was not significant, $p=.21$.

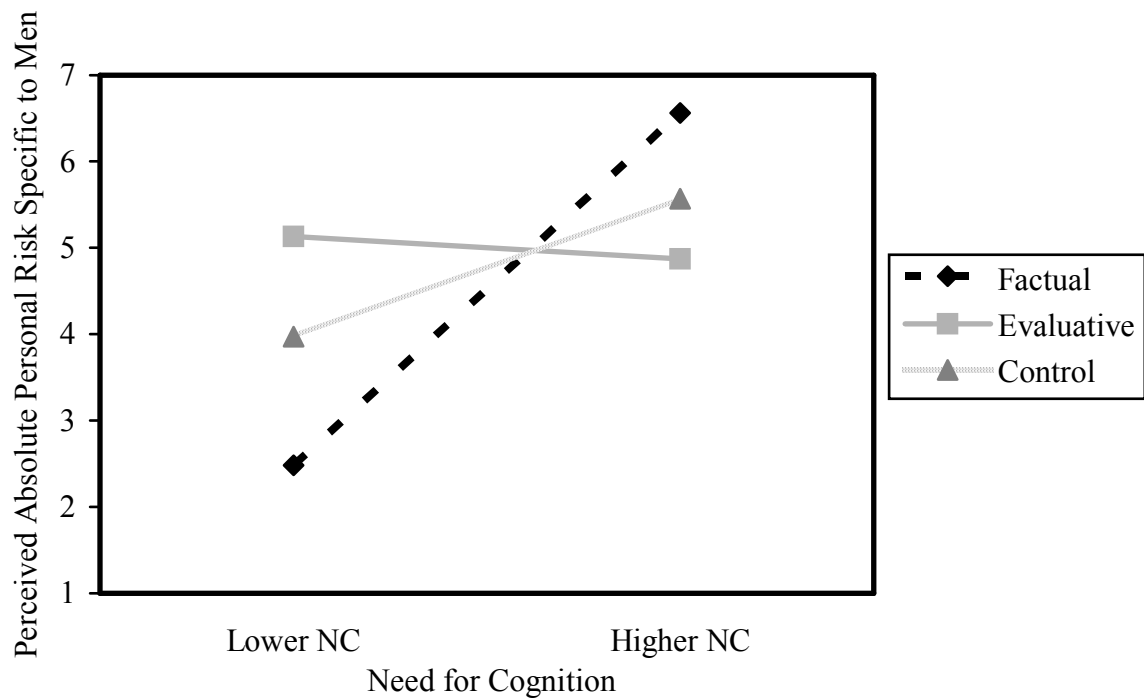


Figure 10. Occasional Smokers: Perceived absolute personal risk specific to men. *Note.* This analysis included only men ($n=25$) and did not control for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was not significant, $p=.31$.

Daily smokers: NC, pamphlet type, and brief risk perception measure. As stated above, all multiple regression analyses examining the potential joint influence of NC and PT on the brief risk perception measure controlled for baseline levels of perceived risk. Contrary to expectations, the NC by PT interaction was not significantly related to any of the brief risk perception measure outcomes (any risk, $\beta=-.41$, $t=-1.39$, $p=.17$;

gastrointestinal problems, $\beta=-.25$, $t=-.79$, $p=.43$; circulatory diseases, $\beta=-.50$, $t=-1.59$, $p=.12$; cancer, $\beta=-.06$, $t=-.25$, $p=.81$; fertility or sexual problems, $\beta=-.41$, $t=-1.21$, $p=.23$).²

Daily smokers: NC, pamphlet type, and full risk perception measure. Analyses examining the NC by PT interaction did not control for baseline risk perceptions. The interaction failed to significantly predict any of the full risk perception measure outcomes (specific absolute personal risks of smoking, $\beta=-.26$, $t=-.63$, $p=.52$; perceived specific risk relative to other smokers, $\beta=-.26$, $t=-.62$, $p=.54$; perceived absolute risk in terms of percent of developing at least one health consequence of smoking, $\beta=.03$, $t=.06$, $p=.95$; absolute risk specific to women (this analysis included only women, $n=71$), $\beta=-.18$, $t=-.41$, $p=.69$; or absolute risk specific to men (this analysis included only men, $n=10$), $\beta=-.21$, $t=-.15$, $p=.89$).²

Occasional versus daily smokers: changes in risk perception. T-tests comparing occasional and daily smokers on pre- to post-pamphlet changes in risk perception indicated that there were no differences between daily and occasional smokers in perceptions of general personal risk ($t(163)=0.59$, $p=.55$; $M=0.57$, $SD=1.99$ vs. $M=0.73$, $SD=1.34$, respectively) or perceived specific personal risk of developing GI problems ($t(164)=0.63$, $p=.53$; $M=0.89$, $SD=1.67$ vs. $M=0.74$, $SD=1.41$, respectively), circulatory diseases ($t(164)=0.63$, $p=.82$; $M=0.33$, $SD=1.88$ vs. $M=0.27$, $SD=1.30$, respectively), cancer ($t(164)=-0.26$, $p=.80$; $M=0.14$, $SD=1.52$ vs. $M=0.19$, $SD=0.94$, respectively), or

² NC was not significantly correlated with BIDR – IM scores ($r=.18$, $p=.10$) for daily smokers. However, because NC was significantly correlated with BIDR – SDE ($r=.29$, $p<.01$) scores among daily smokers, regression analyses were also performed including this variable in the regression models as a covariate. Inclusion of BIDR – SDE scores in the models was not associated with any significant changes in the pattern of results.

fertility or sexual problems ($t(163)=0.96, p=.34; M=1.23, SD=1.66$ vs. $M=0.99, SD=1.51$, respectively).

NC, PT, and Type of Smoker: Potential Combined Influence on Risk Perception Outcomes

In an effort to better understand the observed differential joint influence of NC and PT on post-pamphlet perceptions of risk for occasional versus daily smokers, three-way interactions between NC, PT, and smoking rate (i.e., cigarettes per day) were examined for each of the significant risk perception outcomes described above.

Significant interactions were not found for outcomes from the brief risk perception measure (any risk, $\beta=.27, t=.88, p=.38$; risk of gastrointestinal problems, $\beta=.21, t=.70, p=.48$). However, the NC by PT by smoking rate interaction did significantly predict perceptions of risk relative to other smokers, $\beta=.79, t=2.20, p<.05$. That is, NC and PT jointly influenced perceptions of risk relative to other smokers for occasional but not daily smokers. In addition, the interaction approached significance in predicting perceived general risk in terms of percent, $\beta=.63, t=1.74, p=.084$, indicating that the NC by PT interaction was somewhat more likely to occur among occasional smokers than among daily smokers. The NC by PT by smoking rate interaction did not predict perceptions of specific personal risk, $\beta=.23, t=.65, p=.52$.

Analyses of Proposed Mechanisms: Pamphlet Evaluations and Pamphlet-Relevant Knowledge

In attempt to explain what might have led to the observed changes in risk perception, we looked for concurrent changes in our proposed mechanisms of change. The NC by PT interaction did not significantly predict pamphlet evaluation ratings ($\beta=-.35, t=-.99, p=.33$) or pamphlet-relevant knowledge ($\beta=.18, t=.56, p=.58$).

Behavioral Expectations of Changing Smoking to Reduce Risk

The NC by PT interaction did not significantly predict behavioral expectations of changing smoking behavior to reduce harm ($\beta=.44, t=1.24, p=.22$). The NC by PT interaction did not predict behavioral expectations of changing smoking behavior to reduce harm ($\beta=-.62, t=-1.50, p=.14$).

Occasional Smokers: Effects of Control versus Experimental Pamphlets on Outcomes

Contrary to expectations, one-way ANOVAs indicated that participants who received the experimental pamphlets (i.e., factual or evaluative pamphlets on smoking) failed to report significantly higher perceptions of smoking-relevant risk compared to those in the control condition. Specifically, there were no differences in perceived risk of developing specific health risks of smoking ($F(2,120)=.09, p=.91$), risks specific to women ($F(2,96)=1.19, p=.31$) or men ($F(2,28)=.28, p=.76$), risk compared to other smokers ($F(2,118)=.10, p=.91$), or perceived risk in terms of percent ($F(2,119)=.34, p=.71$).

As expected, participants in the control condition scored significantly worse on the post-pamphlet knowledge measure compared to those in either of the two experimental conditions (i.e., factual and evaluative ($F(2,125)= 108.59, p<.001$; Control $M=6.30, SD=2.87$, Factual $M=15.05, SD=3.20$, Evaluative $M=15.93, SD=2.70$).

Also contrary to expectations, there were no differences across conditions in post-pamphlet expectations of changing one's smoking behavior to reduce risk (i.e., reducing smoking, limiting smoking to certain places or situations, or quitting smoking; ($F(2,104)= 2.35, p=.10$).

Daily Smokers: Effects of Control vs. Experimental Pamphlets on Outcomes

Again, contrary to expectations, one-way ANOVAs indicated that there were no significant post-pamphlet differences in perceived risk of developing specific health consequences of smoking across conditions. Specifically, there were no differences in perceived risk of developing specific health risks of smoking ($F(2,92)=2.84, p=.06$), risks specific to women ($F(2,85)=1.74, p=.18$), risk relative to other smokers ($F(2,93)=1.53, p=.22$), or perceived risk in terms of percent ($F(2,90)=.73, p=.49$). There were no daily male smokers in the control condition, so an analysis comparing risk specific to men could not be performed.

As expected, participants in the control condition scored significantly lower on the post-pamphlet knowledge measure compared to those in either of the two experimental conditions (i.e., factual and evaluative ($F(2,100)=84.66, p<.001$; Control $M=7.25, SD=2.12$, Factual $M=14.71, SD=3.48$, Evaluative $M=17.00, SD=2.48$).

Also contrary to expectations, there were no differences across conditions in post-pamphlet expectations of changing one's smoking behavior to reduce risk (i.e., reducing smoking, limiting smoking to certain places or situations, or quitting smoking, $F(2,93)=.25, p=.78$).

One Month Telephone Follow-Up

Only 44% of participants completed the follow-up. The majority were unable to be reached by telephone. At times, the one-month follow-up calls took place after the semester had ended and participants' phone numbers had changed. Others cited small incentives (i.e., one extra credit point) as a reason for electing not to participate.

Although we did not have strong predictions concerning the effects of the pamphlets at

follow-up, we did try to reach as many participants as possible to see if the pamphlets maintained an effect. One-way ANOVAs and chi-square analyses were performed to examine whether there were baseline differences in demographics, smoking history, NC, or BIDR scores between participants who completed the follow-up and those who did not complete the follow-up. Results indicated that participants who completed the follow-up were significantly more likely than participants who did not complete the follow-up to be psychology majors, $\chi^2(3)=13.74, p<.01$. No other significant differences were found (see Table 3). In addition, one-way ANOVAs indicated that there were no differences between responders and non-responders on baseline risk perceptions (see Table 4). Due to the substantially reduced sample size at follow-up resulting from limited participation ($n=100$), the two groups of smokers (i.e., occasional and daily) were collapsed for purposes of the following analyses.

Table 3

Baseline Differences between Participants who Did and Did Not Complete the Follow-Up

Variable	Completed			Did Not Complete		
	%	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>
Demographics						
Gender						
Female	82			82		
Male	18			18		
Age (years)		20.94	3.21		21.6	5.60
Ethnicity						
Caucasian	74			77		
Black	6			8		
Asian	4			2		
Native American	1			1		
Other	15			12		
Hispanic	24			16		
Marital Status						
Never married	93			94		
Married	2			5		
Separated	3			0		
Divorced	2			1		
Year in school						
Freshman	22			31		
Sophomore	15			21		
Junior	37			26		
Senior	24			19		
Other	2			3		
Academic major						
Psychology	67			47*		
Non-Psychology	33			53*		
GPA						
3.50 to 4.00	24			23		
3.00 to 3.49	44			36		
0.00 to 2.99	32			41		
Smoking History						
Years smoking		5.29	4.31		5.57	5.94
Daily Smokers	46			46		
Cigarettes per day		10.82	6.92		9.83	5.79
Occasional smokers	54			54		
Cigarettes per week		2.57	4.29		3.01	3.43
Need for Cognition (NC)		64.61	10.68		62.17	10.74
BIDR – SDE		5.75	3.18		6.20	3.10
BIDR – IM		5.05	3.09		4.84	3.18

Note. * $p < .01$

Table 4

Baseline Risk Perception for Participants who Did and Did Not Complete the Follow-Up

Brief Risk Perception Measure Items	Completed		Did Not Complete	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Any Health Condition	5.45	1.29	5.16	1.67
Gastrointestinal (GI) problems	4.47	4.23	4.23	1.90
Circulatory Diseases	5.01	1.67	4.7	1.79
Some Type of Cancer	5.35	1.50	5.14	1.78
Fertility and/or Sexual Problems	3.58	1.72	3.88	1.86

Note: All responses were on a 1 to 7 point scale (1=extremely unlikely; 2=unlikely; 3=somewhat unlikely; 4=neither likely nor unlikely; 5=somewhat likely; 6=likely; 7=extremely likely).

Experimental versus control pamphlets. One-way ANOVAs were performed to examine differences in smoking risk perception and risk knowledge across conditions. There were no differences across experimental conditions in perceived risk of developing specific health consequences of smoking, (any risk: $F(2,97)=1.53, p=.22$; GI problems: $F(2,97)=.06, p=.94$; circulatory diseases: $F(2,97)=.29, p=.75$; cancer: $F(2,97)=1.69, p=.19$; fertility or sexual problems: $F(2,97)=.82, p=.45$) or knowledge ($F(2,93)=1.23, p=.30$). A chi-square analysis was performed to examine differences across conditions in self-reported smoking behavior to reduce smoking-related health risks at follow-up. There were no group differences in the adoption of risk-reducing behaviors ($\chi^2(6)=.37, p=.99$).

Risk perception. Controlling for baseline risk perception, a significant NC by PT crossover interaction in the expected direction predicted perceived likelihood of developing any smoking related health condition, $\beta=-.85, t=-2.42, p<.05$ (See Figure 11). Although in the expected direction, the interaction failed to reach significance for any other outcomes

examined: gastrointestinal (GI) problems ($\beta=.01, t=.02, p=.99$; see Figure 12), circulatory problems ($\beta=-.57, t=-1.58, p=.12$; see Figure 13), cancer ($\beta=-.29, t=-.75, p=.43$; see Figure 14), or fertility or sexual problems ($\beta=-.46, t=-1.26, p=.45$; see Figure 15).³

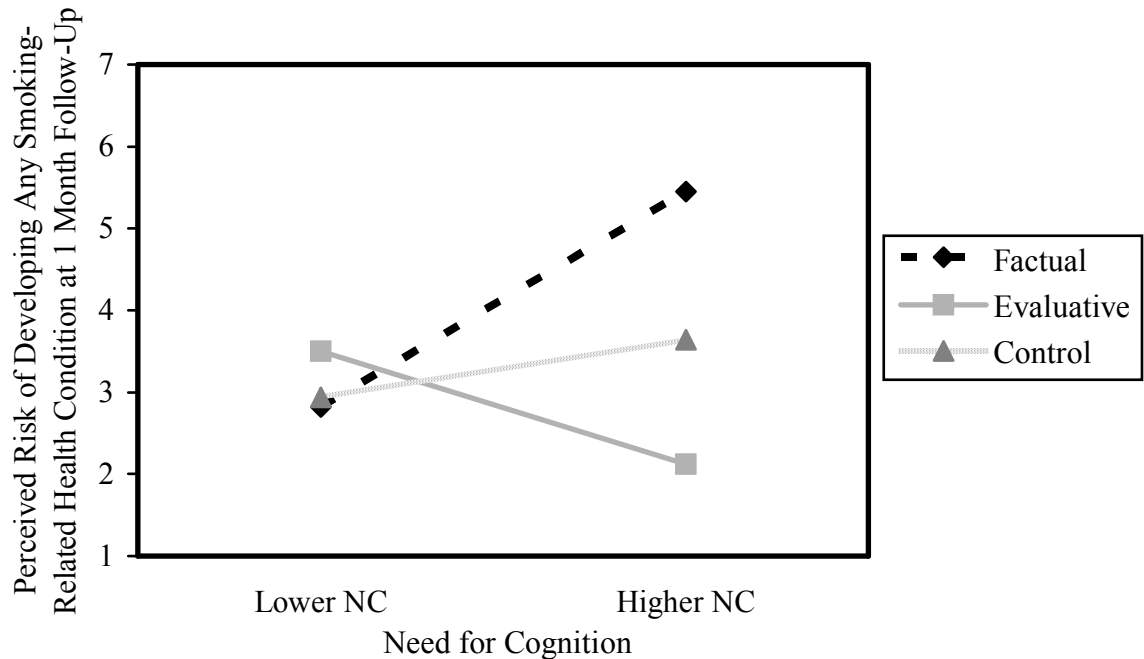


Figure 11. One Month Follow-Up: Perceived personal risk of developing *any* smoking-related health condition as a result of smoking. *Note.* This analysis controlled for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was significant at the $p<.05$ level.

³ Because NC was significantly correlated with BIDR –SDE ($r=.22, p<.01$) and BIDR – IM scores ($r=.17, p<.05$) scores within the entire sample of smokers, regression analyses were also performed including this variable in the regression models as a covariate. Inclusion of BIDR – SDE scores in the models was not associated with any significant changes in the pattern of results.

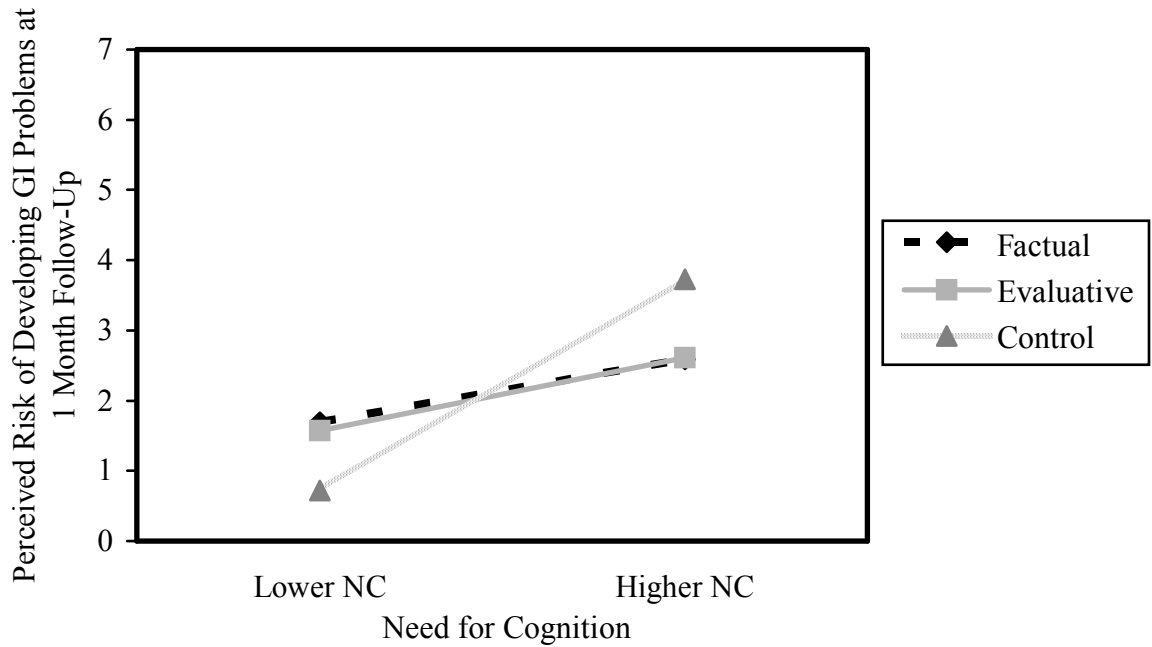


Figure 12. One Month Follow-Up: Perceived personal risk of developing gastrointestinal (GI) problems as a result of smoking. *Note.* This analysis controlled for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was not significant, $p=.99$.

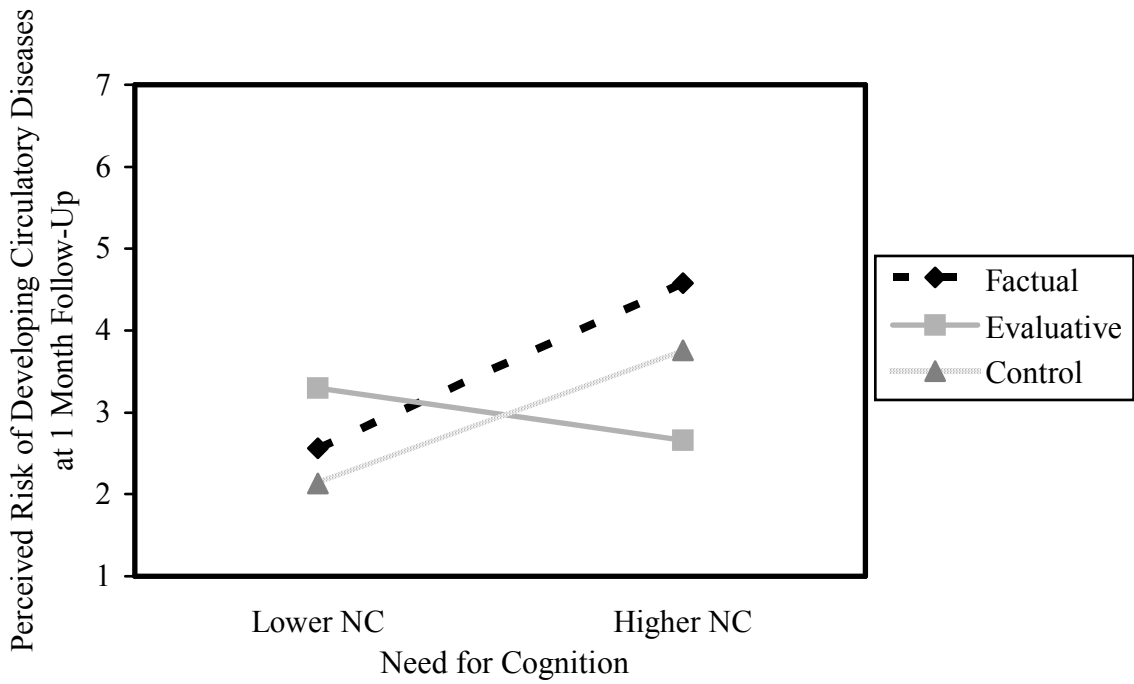


Figure 13. One Month Follow-Up: Perceived personal risk of developing circulatory diseases as a result of smoking. *Note.* This analysis controlled for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was not significant, $p=.12$.

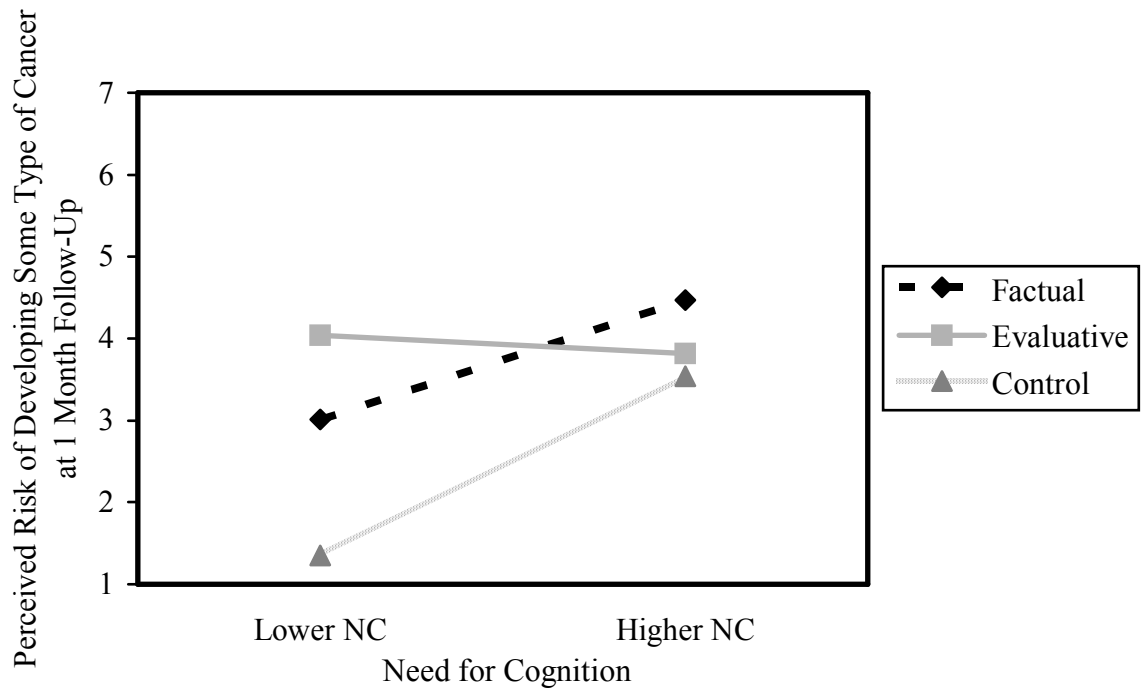


Figure 14. One Month Follow-Up: Perceived personal risk of developing some type of cancer as a result of smoking. *Note.* This analysis controlled for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was not significant, $p=.43$.

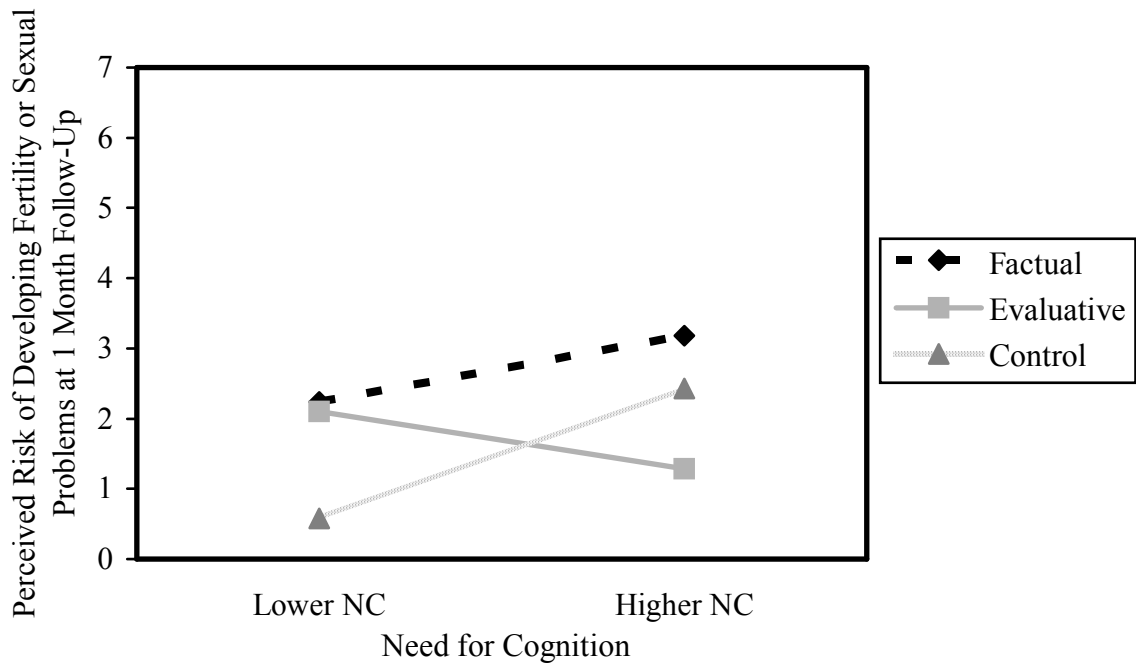


Figure 15. One Month Follow-Up: Perceived personal risk of developing fertility or sexual problems as a result of smoking. *Note.* This analysis controlled for baseline risk perception. The control pamphlet was plotted as a reference but was not included in the analysis. The interaction between NC and PT was not significant, $p=.45$.

Pamphlet relevant knowledge. The NC by PT interaction did not predict levels of pamphlet-relevant knowledge at follow-up, $\beta=-.29$, $t=-.82$, $p=.42$.

Changes in smoking behavior. Multiple regression analyses were used to examine whether NC and PT interacted to predict changes in smoking behavior at follow-up, controlling for post-pamphlet expectations of adopting risk reducing behaviors. The NC by PT interaction did not predict the adoption of risk-reducing behaviors (i.e., reducing smoking, limiting to certain places or situations, quitting completely), $\beta=.07$, $t=.20$, $p=.85$.

Chapter 4

Discussion

Influence of NC and PT on the Construction of Smoking-Relevant Risk Perceptions

Because of the theoretical importance assigned to perceptions of risk within a number of major influential models of health behavior change (i.e., Health Belief Model, Theories of Reasoned Action and Planned Behavior, Protection Motivation Theory), it is important to identify factors that impede or facilitate the processing of risk messages. These findings provide evidence that one's dispositional tendency to engage in and enjoy (or avoid and dislike) effortful cognitive processing of information in general (i.e., NC) interacts with type of risk message to influence perceptions of smoking-related health risks among occasional smokers.

Although we had no strong directional hypotheses, a goal of this study was to examine whether the predicted joint influence of NC and message type would have equivalent or differential effects on the construction of smoking-relevant risk perceptions among lighter (i.e., occasional) versus heavier (i.e., daily) smokers. The pattern of findings that emerged indicated that NC interacted with message type to reliably influence perceptions of risk among occasional but not daily smokers. We found a consistent pattern of hypothesized interactions on all but one measure of risk perception examined and the interaction reached significance for many of these outcomes. Stronger effects might have emerged if our manipulation of smoking risk messages had been

stronger. In the current study, it was important to minimize differences between the pamphlets to reduce the likelihood of confounds. On the other hand, differences between the pamphlets might have been greater if participants had been asked to rate both pamphlets side-by-side.

Although significant, differences between the two smoking risk pamphlets as measured by the manipulation check were relatively small in magnitude. In addition, our range of NC scores was somewhat restricted and skewed toward the higher end of possible scores. This is likely the result of using a college student sample rather than a sample drawn from the general population, where scores would be expected to be lower. In our sample, scores ranged from 33 to 90 with a mean of 63.22 and a standard deviation of 10.76. Scores can potentially range from 18 to 90. Although all of the NC by PT interactions were in the expected direction, visual examination of the plotted interactions suggests that a classic crossover pattern might have emerged for even more outcomes had levels of NC extended further toward the lower end of the range of possible scores.

Occasional and daily smokers were collapsed for all follow-up analyses due to limited participation and a substantially reduced sample size. Nonetheless, results provided some evidence that NC and message type maintained a joint influence on pamphlet-relevant risk perceptions through one-month follow-up. Although this finding should be interpreted with caution, it provides evidence that matched messages led to some relatively long-term changes in perceptions of risk.

The NC by PT interaction disappeared completely in our analyses of daily smokers, suggesting that this type of risk message matching may be most potent among lighter smokers who are less entrenched in their smoking behavior. Three three-way

interactions (i.e., NC by PT by smoking rate) were performed to further clarify the relationship. The interaction was found to significantly predict perceptions of risk relative to other smokers, indicating that this type of message matching was effective for occasional but not daily smokers. The NC by PT by smoking rate interaction approached significance in predicting absolute perceived risk in terms of percent for developing at least one health consequence of smoking, suggesting that the message matching had a somewhat greater impact on occasional versus daily smokers. The interaction was not significant in predicting perceptions of absolute specific personal risk, indicating that a strong conclusion regarding the influence of matching risk messages to NC cannot be drawn for this outcome. In addition, the three-way interaction failed to predict any outcomes from the brief risk perception measure.

The inconsistent pattern of results obtained for analyses examining the three-way interactions may have resulted from the stringent nature of these tests. It is likely that the analyses were under-powered to detect significant effects. Results clearly support the effect of matching risk message content to information processing preferences among occasional smokers. Moreover, the fact that no overall differences between control and experimental conditions on post-pamphlet measures were found highlights the importance of individual difference factors (such as NC) in understanding the effects of health risk messages. That is, messages that are mismatched to readers' level of NC may produce small or no changes in risk perception or may even be associated with *decreases* in perceptions of risk. The failure to consider such factors may account for the modest effects of these messages in the literature (The COMMIT Research Group, 1995).

Potential Mechanisms to Explain Differential Findings as a Function of Smoking Rate

Theoretically, the present findings suggest that a person's degree of experience with smoking cigarettes influences the manner in which smoking-relevant risk information is processed. Whether this finding will generalize across other types of risky behaviors remains to be seen and should be investigated in future research. Current models of health behavior change do not account for such individual differences. It may be that having more experience with a given risky behavior in the absence of negative or harmful consequences provides people with evidence that the behavior may be less risky than they initially expected. In addition, the peer groups of these individuals are likely to view certain risky behaviors such as smoking as more normative. Practically, different types of messages may be necessary for prevention and cessation. Moreover, this type of message matching may be particularly potent as part of early intervention strategies targeting college students because college represents a risky time for the initiation of smoking, as rates of smoking among college students increased by nearly one-third between 1993 and 1997 (Wechsler, Rigotti, Gledhill-Hoyt, & Lee, 1998). The present findings suggest that those students who have not yet progressed to heavier smoking may be most influenced by smoking health risk messages.

There are several possible explanations for why the NC by PT interaction failed to influence perceptions of risk for heavier, daily smokers. One explanation may be that daily smokers experienced greater cognitive dissonance following exposure to novel information concerning health risks of smoking. According to Festinger's (1957) theory, one way to reconcile this dissonance and reduce psychological discomfort would be to minimize acknowledgement of this risk. A second potential explanation for why risk

perceptions of daily smokers were unaffected by the NC by PT interaction is that the risk information was presented in the absence of information on how to successfully *quit* smoking. Considerable research has shown that that fear appeals alone are ineffective, but are powerful in facilitating behavior change when individuals are told specifically how to reduce their risk (see Witte and Allen, 2000 for a meta-analytic review). Third, lighter, social smokers are able to tolerate acknowledging higher levels of perceived risk because they may be less likely to believe they will become addicted and more likely to believe they will quit. Although examination of these questions was outside the scope of the present study, they should each be examined in future research.

Methodological Limitations

We found evidence that NC moderated the effect of pamphlets designed to increase perceptions of risk related to smoking immediately following message exposure and at one-month follow-up. Although NC interacted with PT to influence risk perceptions, the observed effects were relatively small in magnitude. As stated above, it may be that a stronger manipulation would have produced larger effects. The effects found in this study are likely to be of greater theoretical than practical importance and future studies should investigate the potential impact of stronger risk message manipulations. For example, evaluative risk messages could be delivered via videotapes and print-based factual messages could be expanded and elaborated.

The observed changes in risk perception did not occur through either of our proposed mechanisms (i.e., changes in pamphlet evaluation ratings and pamphlet-relevant knowledge). That we failed to observe concurrent changes in either of our proposed mechanisms suggests that this change must have occurred through alternative

mechanisms that were not examined in this study. For example, it is possible that smokers who experienced stronger affective reactions to the messages evidenced larger changes in risk perception. Alternatively, our measures of message processing (i.e., pamphlet-relevant knowledge) might not have been sensitive enough to detect the degree of actual processing that occurred. Future research should investigate more implicit measures of processing (e.g., reaction time, processing speed, response latency). As stated above, our expectations that brief exposure to a smoking risk pamphlet would influence intentions to reduce smoking health risks following exposure or actual smoking behavior change at follow-up were low. That such changes failed to emerge is not surprising.

Implications for Intervention

This study provides evidence that matching smoking risk messages to individual information processing preferences may be particularly useful in motivating lighter, social smokers to quit. Moreover, lighter, social smokers may represent a particularly important group to target because the college years reflect a high-risk time for the initiation of smoking and nearly one-fifth of students transition from occasional to daily smoking during college (Wechsler et al., 1998). Among high school students, only five percent of smokers believe they will continue to smoke as adults, yet nearly seventy five percent have failed to quit by the time they reach adulthood (Charlton, Moyer, & Melia, 1990). Although the joint influence of NC and PT had an effect on increasing smoking-relevant risk perceptions among occasional smokers, changes in risk perception were not accompanied by increases in expectations of reducing risk through changing their smoking behavior. It remains to be seen whether adding this type of risk message

matching to a more intensive, cessation-focused intervention targeted to lighter smokers would add incrementally to the efficacy of such an intervention.

Findings from this study may also have implications for public health interventions. Messages delivered such interventions are intended to reach a large number of people and there has been a relatively recent trend toward simplifying the content of written risk messages in an effort to reach a wider audience (Reid et al., 1995; Meade & Byrd, 1989). Contrary to this practice, the present findings suggest that it may be important to tailor risk messages to levels of NC. Moreover, NC is likely to explain some of the person-to-person variability in risk perceptions observed in previous studies (e.g., van der Plight, 1994). Although this type of tailoring or matching may not be possible via public health campaigns, delivering different types of messages to the public may be one way to address this need. In situations where it is possible to tailor risk messages to specific individuals, NC should be considered.

Final Conclusions

Although risk perceptions have been assigned an important role in major theoretical models of health behavior, relatively little is known about how risk perceptions are constructed or about factors that may impede or facilitate the processing of risk information. Findings from this study supported a consistent pattern of hypothesized interactions between NC and type of risk message on many of risk perception outcomes examined for occasional smokers. This relationship did not emerge for heavier, daily smokers. That NC moderated the influence of different types of smoking risk messages among occasional smokers has important theoretical implications. NC appears to represent an important individual difference variable that influences the

potency of risk messages. Individual difference factors have received relatively little attention in the literature and the results of this study have elucidated a key variable that predicts differential responses to risk information.

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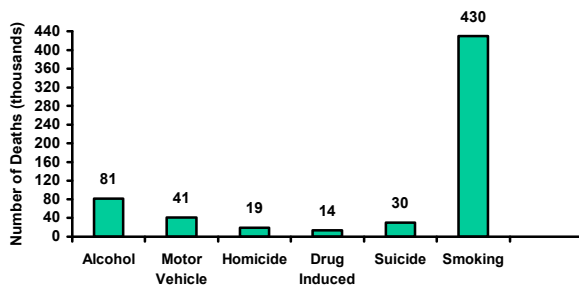
Appendices

Appendix A: Factual Pamphlet

Smoking and Your Health

Cigarette smoking is the single most preventable cause of illness and death in the United States. It kills over 400,000 Americans each year. This number is equivalent to three jets crashing every day, killing everyone on board.

Comparative Causes of Annual Deaths in the United States



Source: Centers for Disease Control and Prevention: National Center for Chronic Disease Prevention and Health Promotion

You probably already know that smoking causes heart disease, chronic obstructive pulmonary disease (COPD) and numerous cancers. However, you may not know about

the link between smoking and other health risks that are less well-known.

Less Known Smoking Risks

- ⇒ Smoking has been linked to increased risk for skin cancer. Direct contact between the skin and several of the 44 known carcinogens present in cigarette smoke is thought to be responsible for this increased risk.
- ⇒ Smoking markedly increases the secretion of acid in the stomach and reduces mucosal blood flow as well as the production of prostaglandin and bicarbonate. This seems to contribute to why smokers are more likely than nonsmokers to develop ulcers and are less likely to respond to treatment that would otherwise be effective. In the event that an ulcer perforates, it can produce additional side effects such as bloody stools or vomiting.
- ⇒ Smokers are more likely than nonsmokers to experience chronic heartburn. Heartburn results from the entry of stomach acid into the esophagus. Specifically, smoking weakens the esophageal valve, allowing stomach acid to splash into the esophagus.
- ⇒ Smoking reduces the ability of the liver to process certain medications that are

ingested. In order to compensate for this, a smaller dose of medication may often be

required for smokers (vs. nonsmokers) in order to avoid over-dosing.

- ⇒ Each year in the US 34,000 deaths from heart disease and 8,000 deaths from stroke among women are directly attributable to smoking. According to the National Institutes of Health (NIH), women who smoke are between two and six times more likely to experience a heart attack.
- ⇒ Much scientific evidence has documented that smoking markedly reduces bone mineral density among women. This significantly increases the risk of osteoporosis (porous bones) as well as the risk of bone fractures.
- ⇒ Current and past smokers are more likely to develop Crohn's disease (causing chronic pain and diarrhea), and to require repeat surgery to treat it. 3 scientific explanations have been proposed to explain this link: 1) smoking impedes blood flow to the intestine; 2) smoking produces immune system changes that lead to inflammation; 3) smoking lowers the intestine's natural defenses.

Appendix A: Factual Pamphlet (Continued)

- ⇒ Buerger's disease occurs when blood vessels in the extremities become constricted or completely obstructed due to clots or inflammation, reducing blood flow to these areas. Eventually, body tissue dies and amputation of the affected extremities is frequently necessary. The disease almost always occurs in male smokers aged 20 to 40. There is no cure and quitting smoking is the only way to stop its progression.
- ⇒ A recent study published in the journal *Community Dentistry and Oral Epidemiology* indicates that teenagers who smoke are three times more likely than those who don't to develop gum disease (leading to tooth loss) in their mid-20's. The study results were based on longitudinal reports of 914 subjects' smoking histories at the ages of 15, 18, 21, and 26.
- ⇒ Data from the *American College of Obstetricians and Gynecologists (ACOG)* indicate that smoking significantly increases a woman's likelihood of developing cervical cancer. Treatment is often invasive and uncomfortable. A number of empirical studies suggest that the accumulation of metabolites and other constituents of nicotine in the

cervical mucus is the most likely explanation for this increased risk. Young women who smoke are at an increased risk for brain aneurysms (build-up of blood that weakens a wall of the blood vessel). Emerging scientific evidence indicates that nicotine attacks the blood vessels within the cerebrum. About 60% of all ruptured brain aneurysms lead to death or permanent disability.

Smoking and Sex

- ⇒ Results of a study published in the *American Journal of Epidemiology* that included 4,462 participants indicated that men who smoked cigarettes were 1.8 times more likely than men who didn't to experience sexual impotence (erectile dysfunction).
- ⇒ A study conducted at the University of Kentucky indicated that men in their 20's and 30's who smoked reported having sex half as often as nonsmoking men in the same age range. Smokers also reported their sexual desire (on a 10-point scale) to be significantly lower than that of nonsmokers (rating = 5.2 versus 8.7).

Smoking and Fertility

- ⇒ Smoking causes varicoceles (vericose veins in the testicles) in men, reducing fertility. One theoretical explanation for this posits that varicoceles may prevent certain enzymes located within the sperm from initiating fertilization.
- ⇒ According to the *American College of Obstetricians and Gynecologists (ACOG)*, women who smoke report a 50% increase in menstrual cramps that persists for at least two days. Studies further indicate that smoking increases the risk of having irregular periods as well as the risk of amenorrhea (the absence of normal periods).
- ⇒ Smoking reduces the chances that a woman will ovulate and lowers the probability that a fertilized egg will successfully implant in her uterus.

**Smoking and
Health:
Risks You
May **NOT**
Be Aware Of**

Appendix B: Evaluative Pamphlet

Smoking and Your Health

Cigarette smoking is the single most preventable cause of illness and death in the United States. It kills over 400,000 Americans every year. This number is equivalent to three jets crashing **every day**, killing everyone on board. Smoking also kills more people than many other risky behaviors such as alcohol, illegal drugs, and car accidents **combined**.

You probably already know that smoking is bad for your health. However, you may **not know about** the link between smoking and other health risks that are less well-known.



Less Known Smoking Risks

⇒ Smoking magnifies the damaging effects of the sun's rays. Skin damage resulting from smoking and sun exposure often develops into ugly and potentially deadly skin cancer, if it is not surgically removed in time.

- ⇒ Smokers are much more likely than nonsmokers to be plagued by the distressing and dangerous symptoms of ulcers. Ulcers can cause internal bleeding (that is hard to detect) and can produce stabbing, intense pain that courses through the abdomen. This terrible pain sometimes radiates to the back or to the chest. If an ulcer perforates, a smoker may suffer from black or bloody stools or vomit either blood or a substance similar to coffee grounds.
- ⇒ Smokers are more likely than nonsmokers to suffer from the pain of chronic heartburn. Many smokers will tell you about numerous sleepless nights after a late meal that result from stomach acid churning up into their throats and burning their chests.
- ⇒ In many cases, smokers must endure the unpleasant side effects of medication longer because a normal dose of medicine is too strong. This is due to differences in the ways that smokers' and nonsmokers' livers handle medications.



⇒ Smoking claims a multitude of women's lives each year by causing heart disease

and stroke. Experts have found that, after enduring a heart attack or stroke that is not fatal, a striking number of women suffer from pain and/or loss of the ability to perform normal daily tasks.

- ⇒ Smoking causes the bones to become weak and brittle and increases the risk of breaks and fractures, especially among women. These extremely painful injuries often cause prolonged suffering before finally healing.
- ⇒ People with a history of regular smoking or who currently smoke are much more likely to suffer from the painful and incapacitating symptoms of Crohn's disease. This illness, made significantly worse by smoking, causes almost constant stomach pain and lingering diarrhea. Also, smokers often have to suffer through more than one surgery before they experience any relief or improvement.
- ⇒ Almost everyone who develops Buerger's disease is a smoker. Most victims of this disease are men aged 20 to 40. Buerger's disease is extremely painful and causes the death of body tissue in the hands and feet, leading to gangrene. Sadly, in most cases, fingers, toes, feet, hands, arms or legs must be amputated. There is no cure for the disease and quitting smoking is the only way to save limbs that remain unharmed.
- ⇒ Teenagers who smoke are at a much higher risk of developing gum disease compared to those who don't smoke. By

Appendix B: Evaluative Pamphlet (Continued)

the time these individuals have reached their mid-20's, they have often permanently damaged their teeth and gums without knowing it. Smokers who suffer from gum disease eventually lose many of their teeth and must endure several painful dental visits.



- ⇒ Most women who smoke cigarettes are not aware that they are at a much higher risk for developing cancer of the cervix. Women whose doctors think they might have this type of cancer must undergo a painful and scary diagnostic test (while fully awake) in which a cone-shaped piece of the cervix is cut out and examined. If cancer cells are found, the cervix must be frozen to the point that icicles form and the cancer cells die.
- ⇒ Young women who smoke are at serious risk for developing brain aneurysms (build-up of blood that weakens the wall of a blood vessel in the brain), which can kill instantly. One 30 year-old smoker who survived reported that her aneurysm "came on suddenly," and that it felt as if she had been "hit by a sledgehammer."

Smoking and Sex

- ⇒ Men who smoke are considerably more likely than men who don't to suffer from the embarrassing and upsetting problem of being unable to perform sexually. Unfortunately, many men are not aware that this is a possible health risk caused by smoking.
- ⇒ Men in their 20's and 30's who smoke cigarettes tend to report lower levels of desire for sex and to get less satisfaction from sex compared to men who do not smoke. Studies also indicate that men who smoke report having sex much less often compared to men who do not smoke, probably because they find it less pleasurable.



Smoking and Fertility

- ⇒ Men who smoke are at a higher risk for developing varicose veins that appear in the testicles. Men who experience this distressing problem are much more likely

to suffer the pain and disappointment of being unable to biologically father a child.

- ⇒ Smoking is likely to cause severely painful menstrual cramps that last for a longer period of time than is normal. Women who smoke are also more likely to have their periods sporadically and to worry about whether or not they may be pregnant when their periods are late. Some women who smoke even completely stop having their periods.
- ⇒ A woman who smokes is much more likely than a woman who doesn't to be plagued by the heartbreaking tragedy of being unable to conceive a child of her own.

**Smoking and
Health:
Risks You
May **NOT** Be Aware
Of**

Appendix C: Control Pamphlet

Foodborne Illness

Millions of cases of foodborne illness (otherwise known as food poisoning) are documented every year. Encouragingly, most cases can be prevented through cooking and processing food properly. Foodborne illness is caused by eating food that contains certain types of bacteria called pathogens.

In order to protect yourself against foodborne illness, it is important to keep and prepare food in a safe manner and to be aware of potential risks when eating out.

What is Foodborne Illness?

- ⇒ Eating food that contains harmful bacteria, toxins, parasites, viruses, or chemicals can cause foodborne illness. Some people become ill after eating a few of these, while others eat thousands and experience no symptoms.
- ⇒ Foodborne illness is most commonly caused by eating food that contains bacteria and viruses such as *Campylobacter*, *Salmonella*, and *Norwalk-like viruses*. Bacteria may be present on purchased foods that are not sterile (e.g., meat, poultry, eggs, fresh produce). Safe foods may also become cross-contaminated with bacteria that is transferred from contaminated foods.

- ⇒ Poor personal hygiene also increases the risk of contamination.
- ⇒ Once a person has eaten a contaminated food, signs and symptoms of illness may appear as early as a half-hour later or may not appear for up to three weeks. Symptoms of foodborne illness are often flu-like and may include nausea, vomiting, diarrhea, or fever.
- ⇒ After symptoms begin to appear, they may last for a few hours or may persist for several days after a contaminated food has been ingested. Some foodborne illnesses can even have more lasting effects that persist for months or years.
- ⇒ Foods that are particularly likely to become contaminated include perishable items such as eggs, milk products, meats, poultry, fish, shellfish, and fresh fruits and vegetables. You can also decrease your risk by avoiding unpasteurized juices and milk products.

Preventing Foodborne Illness

- ⇒ Before handling food or utensils that may come into contact with food, you should always thoroughly wash your hands in warm, soapy water for at least twenty seconds. This will help destroy any bacteria or viruses.
- ⇒ You should always wash your hands after handling food (particularly raw meat, poultry, fish, shellfish, or eggs). After you have prepared any of these foods, it is important to wash surfaces and cooking tools that have been in contact with the food with hot soapy water. In addition, cutting boards should be replaced once they have become worn or develop grooves that may be difficult to clean.
- ⇒ Make sure that foods are thoroughly cooked. In order to ensure foods like meat, poultry, and eggs are safe, it is best to use a food thermometer to check the temperature. When reheated, sauces, soups, marinades, and gravies should be brought to a boil. Leftovers should be reheated to at least 165° F. Undercooked hamburger, raw fish (including sushi), clams, and oysters are at particularly high risk for contamination.
- ⇒ It is very important that raw, cooked, and prepared foods be separated during shopping, cooking, and preparation. This will prevent cross-contamination between foods. In addition, uncooked meat, poultry, fish, and shellfish should be refrigerated in separate leak-proof containers so that their juices are unable to drip onto other foods.
- ⇒ Perishable foods should be refrigerated promptly. When shopping for food at the grocery store, it is a good idea to select

Appendix C: Control Pamphlet (Continued)

perishable items last and to take them home to be refrigerated or frozen immediately. Foods such as meat, poultry, eggs, and seafood should be refrigerated within two hours when they are purchased or prepared. In addition, leftovers that are refrigerated should be eaten within three to four days.

⇒ It is very important to keep and serve hot foods hot (140° F or above) and cold foods cold (40° F or below). This is because bacteria multiply very quickly between 40° F and 140° F. Meat, poultry, eggs, and shellfish should never be left at room temperature for more than two hours, even if they have been cooked.

⇒ If you are not sure whether a food has been prepared or stored safely, throw it out. Such foods may contain a toxin that cannot be destroyed by cooking. Food left un-refrigerated for more than 2 hours should be thrown out, even if it looks or smells fine.

***Foodborne
Illness:***
Risks You
May **NOT** Be Aware
Of

Appendix D: Pre-Pamphlet Measures

Demographic Questionnaire

The following questions are about you and your life situation. You are under no obligation to answer any question that you find objectionable. However, we would appreciate your answering as many questions as possible. All answers will be kept confidential.

1. What is your age? _____ Date of Birth: _____

2. What is your current year in school?
 Freshman
 Sophomore
 Junior
 Senior
 Other (Please explain) _____

3. What is your major? _____

4. What is your GPA?
 4.0 to 3.75 3.74 to 3.5 3.49 to 3.25 3.24 to 3.0 2.99
to 2.75
 2.74 to 2.5 2.49 to 2.25 2.24 to 2.0 1.9 to 1.75 1.74
to 1.5
 1.49 to 1.25 1.24 to 1.0 less than 1.0

5. What is your marital status?
 Single Separated Widowed
 Married Divorced

6. With which ethnic/racial group do you most identify yourself? (please check one)
 Oriental/Asian American/Pacific Islander
 Black/African American
 Native American
 White/Caucasian
 Other

6a. Are you Hispanic? Yes No

Smoking Status Questionnaire

4. Date of birth: _____ / _____ / _____
Month Day Year

5. Sex: (check one) Male Female

6. Do you smoke cigarettes every day? Yes No

If you answered YES to #3, please skip to question #8 and answer all remaining questions. If you answered No to #3, please answer ONLY questions 4 – 7.

4. Have you ever smoked a cigarette: Yes No

5. Have you had a cigarette in the past month? Yes No

6. Did you ever smoke every day? Yes No

- If YES,*
- a. How many did you smoke? _____
 - b. How long has it been since you stopped? _____
 - c. When you were smoking daily, how many cigarettes per day did you usually smoke? _____

7. Do you ever smoke now? Yes No

If Yes, I smoke an average of ____ cigarettes per: (*circle one*) a. Week; b. Month; c. Year

8. How many years have you been smoking daily? _____

9. How many cigarettes per day do you smoke? _____

10. Do you inhale? NEVER SOMETIMES ALWAYS

PLEASE TURN OVER →

11. Do you smoke more during the first two hours of the day than during the rest of the day?

Yes No

12. How soon after you wake up do you smoke your first cigarette?

Within 5 minutes

6 - 30 minutes

31 - 60 minutes

After 60 minutes

13. Which of all the cigarettes you smoke in a day would you most hate to give up?

The first one in the morning

The one with breakfast

The one with lunch

The one with dinner

The last cigarette before going to bed

Other: _____

14. Do you find it difficult to refrain from smoking in places where it is forbidden, e.g., in church, at the library, theatre, etc.?

Yes No

15. Do you smoke if you are so ill that you are in bed most of the day?

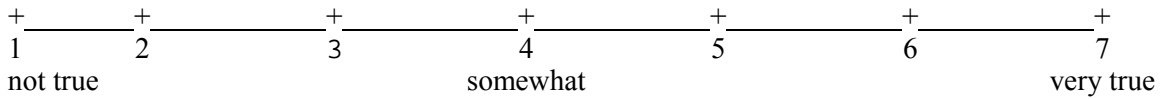
Yes No

16. How confident are you that you will not be smoking one year from now?

(Please circle one)

0	10	20	30	40	50	60	70	80	90	100
Not at all					Moderately					Extremely
confident					confident					confident

Using the scale below as a guide, write a number beside each statement to indicate how true it is.



- ___ 21. I sometimes tell lies if I have to.
- ___ 22. I never cover up my mistakes.
- ___ 23. There have been occasions when I have taken advantage of someone.
- ___ 24. I never swear.
- ___ 25. I sometimes try to get even rather than forgive and forget.
- ___ 26. I always obey laws, even if I'm unlikely to get caught.
- ___ 27. I have said something bad about a friend behind his/her back.
- ___ 28. When I hear people talking privately, I avoid listening.
- ___ 29. I have received too much change from a salesperson without telling him or her.
- ___ 30. I always declare everything at customs.
- ___ 31. When I was young I sometimes stole things.
- ___ 32. I have never dropped litter on the street.
- ___ 33. I sometimes drive faster than the speed limit.
- ___ 34. I never read sexy books or magazines.
- ___ 35. I have done things that I don't tell other people about.
- ___ 36. I never take things that don't belong to me.
- ___ 37. I have taken sick-leave from work or school even though I wasn't really sick.
- ___ 38. I have never damaged a library book or store merchandise without reporting it.
- ___ 39. I have some pretty awful habits.
- ___ 40. I don't gossip about other people's business.

Need for Cognition Scale –Short Form

For each of the statements below, please indicate to what extent the statement is characteristic of you. If the statement is extremely uncharacteristic of you (not at all like you) please circle the "1" to the right of the question; if the statement is extremely characteristic of you (very much like you) please circle the "5" next to the question. Of course, a statement may be neither extremely uncharacteristic nor extremely characteristic of you; if so, please use the number in the middle of the scale that describes the best fit. Please keep the following scale in mind as you rate each of the statements below: 1 = extremely uncharacteristic; 2 = somewhat uncharacteristic; 3 = uncertain; 4 = somewhat characteristic; 5 = extremely characteristic.

	extremely <i>un</i>characteristic			extremely characteristic
1. I would prefer complex to simple problems.				
2. I like to have the responsibility of handling a situation that requires a lot of thinking.	1	2	3	4 5
3. Thinking is not my idea of fun.	1	2	3	4 5
4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.	1	2	3	4 5
5. I try to anticipate and avoid situations where there is a likely chance I will have to think in depth about something.	1	2	3	4 5
6. I find satisfaction in deliberating hard for long hours.	1	2	3	4 5
7. I only think as hard as I have to.	1	2	3	4 5
8. I prefer to think about small, daily projects to long-term ones.	1	2	3	4 5
9. I like tasks that require little thought once I've learned them.	1	2	3	4 5
10. The idea of relying on thought to make my way to the top appeals to me.	1	2	3	4 5
11. I really enjoy a task that involves coming up with new solutions to problems.	1	2	3	4 5

- | | | | | | |
|---|---|---|---|---|---|
| 12. Learning new ways to think doesn't excite me very much. | 1 | 2 | 3 | 4 | 5 |
| 13. I prefer my life to be filled with puzzles I must solve. | 1 | 2 | 3 | 4 | 5 |
| 14. The notion of thinking abstractly is appealing to me. | 1 | 2 | 3 | 4 | 5 |
| 15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought. | 1 | 2 | 3 | 4 | 5 |
| 16. I feel relief rather than satisfaction after completing a task that required a lot of mental effort. | 1 | 2 | 3 | 4 | 5 |
| 17. It's enough for me that something gets the job done; I don't care how or why it works. | 1 | 2 | 3 | 4 | 5 |
| 18. I usually end up deliberating about issues even when they do not affect me personally. | 1 | 2 | 3 | 4 | 5 |

Appendix E: Post-Pamphlet Measures

Smoking and Health Knowledge

The following questions refer to specific health risks of smoking. Please try your best to answer each question as accurately as possible. If do not know the answer a particular question, please provide your best guess.

1. There is evidence that smoking is linked to all but one of the following health conditions. Please circle the disease or medical condition listed below that has **not** been linked to smoking.
 - a. skin cancer
 - b. breast cancer
 - c. heartburn
 - d. gum disease

2. The number of Americans killed by smoking every year is equivalent to the number of deaths that would occur if three jet planes crashed _____, leaving no survivors.
 - a. every month
 - b. every hour
 - c. every day
 - d. every year

3. Buerger's disease causes the death of body tissue in the hands and feet and usually requires that affected limbs be amputated. It occurs almost exclusively in which of the following groups of people?
 - a. female smokers over the age of 50
 - b. teenage smokers
 - c. male smokers between the ages of 20 and 40
 - d. male smokers over the age of 70

4. Smoking has which of the following effects on the liver?
 - a. smoking helps the liver to process medications more effectively
 - b. smoking leads to cirrhosis of the liver
 - c. smoking impairs the liver's ability to process medications
 - d. smoking is associated with cancer of the liver

5. Smoking increases a person's risk of developing ulcers. Which of the following symptoms is **not** associated with ulcers?
- vomiting
 - bloody stools
 - pain
 - numbness or tingling in the abdomen
6. Which of the following diseases causes stomach pain and diarrhea and is made significantly worse by smoking?
- Buerger's Disease
 - Diverticulitis
 - Crohn's Disease
 - Irritable Bowel Syndrome (IBS)
7. Which of the following diseases are teenagers who smoke likely to develop as a result of smoking by the time they have reached their mid-20's?
- heart disease
 - impotence (erectile dysfunction)
 - osteoporosis
 - gum disease
8. Smoking increases the risk of brain aneurysms most for which group of people?
- older women
 - young women
 - young men
 - Mothers
9. Smoking substantially increases the risk of developing which one of the following types of cancer in women?
- breast cancer
 - cancer of the ovaries
 - cancer of the uterus
 - cancer of the cervix
10. Women of childbearing age who smoke and are trying to become pregnant are more likely to _____.
- have a miscarriage
 - experience an ectopic pregnancy
 - have trouble getting pregnant (i.e., conceiving)
 - have a child of low birth weight

11. Smoking causes which of the following problems that reduces fertility in men?
- vericose veins in the testicles (varicoceles)
 - testicular cancer
 - enlarged prostate
 - colon cancer
12. Smoking can affect a woman's menstrual cycle in **all but which one** of the following ways?
- can cause more painful cramps
 - can cause a woman to stop having periods altogether (amenorrhea)
 - can cause periods that last longer
 - can cause irregular periods
13. Men who smoke are more likely to report all of the following **except**:
- having sex less often
 - reporting a lower level of desire for sex
 - experiencing sexual impotence (erectile dysfunction)
 - having fewer sexual partners
14. Smokers are at increased risk for:
- chronic heartburn
 - constipation
 - heart palpitations
 - nausea
15. Smoking places individuals at greater risk for developing:
- bone cancer
 - skin cancer
 - brain tumors
 - renal failure
16. What is a specific health risk associated with smoking that can kill instantly?
- chronic obstructive pulmonary disease (COPD)
 - brain tumors
 - brain aneurysms
 - Buerger's Disease
17. Among women, smoking can cause:
- hair loss
 - anemia

- c. weak and brittle bones (i.e., osteoporosis)
 - d. premature menopause
18. _____, a health condition associated with smoking, can eventually cause bloody stools and/or vomiting.
- a. Ulcers
 - b. Crohn's Disease
 - c. chronic heartburn
 - d. reduced liver function
19. Which one of the following diseases **can only be prevented from progressing** by quitting smoking?
- a. Crohn's Disease
 - b. Heart Disease
 - c. Buerger's Disease
 - d. chronic obstructive pulmonary disease (COPD)
20. _____ and _____ together cause a very large number of deaths among women every year and are directly caused by smoking.
- a. ovarian cancer and cervical cancer
 - b. heart disease and stroke
 - c. brain aneurysms and blood clots
 - d. Crohn's Disease and Buerger's Disease

Pamphlet Evaluation Scale

Regarding the health risk pamphlet you just read, please rate your responses to each of the following items on the scale from 1 = "*not at all*" to 9 = "*extremely*".

	not at all									extremely
How <i>convincing</i> did you find the message you have just read?	1	2	3	4	5	6	7	8	9	
How <i>interesting</i> did you find the message?	1	2	3	4	5	6	7	8	9	
As you read the message, how <i>confident</i> did you feel in your ability to understand it and to interpret it correctly?	1	2	3	4	5	6	7	8	9	
How <i>well-written</i> was the message?	1	2	3	4	5	6	7	8	9	
How <i>believable</i> were its claims?	1	2	3	4	5	6	7	8	9	
How <i>coherent</i> were its arguments?	1	2	3	4	5	6	7	8	9	
How <i>persuasive</i> was the message?	1	2	3	4	5	6	7	8	9	
How <i>difficult</i> was it to read?	1	2	3	4	5	6	7	8	9	
To what degree did you <i>already know about</i> the specific health risk information included the message?	1	2	3	4	5	6	7	8	9	

Brief Risk Perception Measure

Instructions: The questions below ask about your perceptions of smoking-related health risks. For each question below, please circle the response that best matches the way you feel *right now, at this moment*.

1. How likely do you think you are **personally** to develop any smoking-related health condition as a result of your smoking?

<i>Extremely Unlikely</i>	<i>Unlikely</i>	<i>Somewhat Unlikely</i>	<i>Neither Likely Nor Unlikely</i>	<i>Somewhat Likely</i>	<i>Likely</i>	<i>Extremely Likely</i>
1	2	3	4	5	6	7

2. How likely do you think you are **personally** to develop each of the following health conditions as a result of your smoking?

	<i>Extremely Unlikely</i>	<i>Unlikely</i>	<i>Somewhat Unlikely</i>	<i>Neither Likely Nor Unlikely</i>	<i>Somewhat Likely</i>	<i>Likely</i>	<i>Extremely Likely</i>
Gastrointestinal (GI) problems (chronic heartburn, ulcers, Crohn's Disease)	1	2	3	4	5	6	7
Circulatory Diseases (heart disease, stroke, Buerger's Disease)	1	2	3	4	5	6	7
Some type of cancer (skin cancer, cervical cancer)	1	2	3	4	5	6	7
Fertility and/or Sexual Problems	1	2	3	4	5	6	7

Full Risk Perception Measure

Instructions: The questions below ask about your perceptions of smoking-related health risks. For each question below, please circle the response that best matches the way you feel *right now, at this moment*.

1. How likely do you think you are **personally** to develop any smoking-related health condition as a result of your smoking?

<i>Extremely Unlikely</i>	<i>Unlikely</i>	<i>Somewhat Unlikely</i>	<i>Neither Likely Nor Unlikely</i>	<i>Somewhat Likely</i>	<i>Likely</i>	<i>Extremely Likely</i>
1	2	3	4	5	6	7

2. How likely do you think you are **personally** to develop each of the following health conditions as a result of your smoking?

	<i>Extremely Unlikely</i>	<i>Unlikely</i>	<i>Somewhat Unlikely</i>	<i>Neither Likely Nor Unlikely</i>	<i>Somewhat Likely</i>	<i>Likely</i>	<i>Extremely Likely</i>
Gastrointestinal (GI) problems (chronic heartburn, ulcers, Crohn's Disease)	1	2	3	4	5	6	7
Circulatory Diseases (heart disease, stroke, Buerger's Disease)	1	2	3	4	5	6	7
Some type of cancer (skin cancer, cervical cancer)	1	2	3	4	5	6	7
Fertility and/or Sexual Problems	1	2	3	4	5	6	7

IF YOU ARE A WOMAN: How likely do you think you are **personally** to develop each of the following health conditions as a result of smoking?

	<i>Extremely Unlikely</i>	<i>Unlikely</i>	<i>Somewhat Unlikely</i>	<i>Neither Likely Nor Unlikely</i>	<i>Somewhat Likely</i>	<i>Likely</i>	<i>Extremely Likely</i>
Weak or Brittle Bones (Osteoporosis)	1	2	3	4	5	6	7
Brain Aneurysm	1	2	3	4	5	6	7
Fertility Problems (irregular periods, stopping your period altogether, [amenorrhea], having trouble getting pregnant)	1	2	3	4	5	6	7

IF YOU ARE A MAN: How likely do you think you are **personally** to develop the following health condition as a result of smoking?

	<i>Extremely Unlikely</i>	<i>Unlikely</i>	<i>Somewhat Unlikely</i>	<i>Neither Likely Nor Unlikely</i>	<i>Somewhat Likely</i>	<i>Likely</i>	<i>Extremely Likely</i>
Sexual Problems (reduced sex drive, impotence)	1	2	3	4	5	6	7

Compared to other smokers your same age and sex, how would you rate your risk of developing each of the following health conditions? Use the following scale to guide your responses.

3 How likely do you think you are **personally** to develop each of the following health conditions as a result of your smoking?

	<i>Extremely Unlikely</i>	<i>Unlikely</i>	<i>Somewhat Unlikely</i>	<i>Neither Likely Nor Unlikely</i>	<i>Somewhat Likely</i>	<i>Likely</i>	<i>Extremely Likely</i>
Gastrointestinal (GI) problems (chronic heartburn, ulcers, Crohn's Disease)	1	2	3	4	5	6	7
Circulatory Diseases (heart disease, stroke,							

Buerger's Disease)	1	2	3	4	5	6	7
Some type of cancer (skin cancer, cervical cancer)	1	2	3	4	5	6	7
Gum Disease	1	2	3	4	5	6	7

4. What do you believe your chances are of developing at least one health consequence of smoking? Use the following scale to guide your responses and *circle* your response on the line.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
I will definitely <i>not</i>					I have a 50/50			I will definitely		
develop					chance of developing ...			develop ...		

Behavioral Expectations of Reducing Smoking Risks

All things considered, *how likely* it is that you will actually perform the behaviors listed below at some point during the next two months: (Circle the most appropriate number for each behavior.)

	<i>JEXTREMELY UNLIKELY</i>				<i>EXTREMELY LIKELY</i>				
1. Cut down on the number of cigarettes I smoke.	1	2	3	4	5	6	7	8	9
2. Begin to limit my smoking to certain places or situations.	1	2	3	4	5	6	7	8	9
3. Quit smoking completely.	1	2	3	4	5	6	7	8	9

Appendix F: One Month Follow-Up Measures

Follow-Up Measure of Smoking-Related Health Behavior Changes

Interviewer: "How much do you currently smoke?" _____ cig/day

"In the past month, have you ..."

- | | | |
|---|-----|----|
| 1. Cut down at all on the number of cigarettes you smoke? | YES | NO |
| 2. Begun to limit your smoking to certain places or situations? | YES | NO |
| 3. Quit smoking completely? | YES | NO |

Follow-Up Measure of Smoking-Related Health Risk Perceptions

Interviewer: "The following four questions ask about your perceptions of smoking-related health risks. For each question that I ask, please tell me the response that best matches the way you feel right now, at this moment."

1. How likely do you think you are **personally** to develop any smoking-related health condition as a result of your smoking?

<i>Extremely Unlikely</i>	<i>Unlikely</i>	<i>Somewhat Unlikely</i>	<i>Neither Likely Nor Unlikely</i>	<i>Somewhat Likely</i>	<i>Likely</i>	<i>Extremely Likely</i>
1	2	3	4	5	6	7

3. How likely do you think you are **personally** to develop each of the following health conditions as a result of your smoking?

	<i>Extremely Unlikely</i>	<i>Unlikely</i>	<i>Somewhat Unlikely</i>	<i>Neither Likely Nor Unlikely</i>	<i>Somewhat Likely</i>	<i>Likely</i>	<i>Extremely Likely</i>
Gastrointestinal (GI) problems (chronic heartburn, ulcers, Crohn's Disease)	1	2	3	4	5	6	7
Circulatory Diseases (heart disease, stroke, Buerger's Disease)	1	2	3	4	5	6	7
Some type of cancer (skin cancer, cervical cancer)	1	2	3	4	5	6	7
Fertility and/or Sexual Problems	1	2	3	4	5	6	7

Follow-Up Smoking Health Risk Knowledge Questionnaire

Interviewer: "As I read the following list of health conditions and diseases to you, please tell me whether or not each one can be caused or made worse by smoking cigarettes."

1. Skin Cancer	<input checked="" type="checkbox"/> YES	NO
2. Cirrhosis of the Liver	YES	<input checked="" type="checkbox"/> NO
3. Pelvic Inflammatory Disease (PID)	YES	<input checked="" type="checkbox"/> NO
4. Buerger's Disease	<input checked="" type="checkbox"/> YES	NO
5. Crohn's Disease	<input checked="" type="checkbox"/> YES	NO
6. Breast Cancer	YES	<input checked="" type="checkbox"/> NO
7. Gum Disease	<input checked="" type="checkbox"/> YES	NO
8. Colon Cancer	YES	<input checked="" type="checkbox"/> NO
9. Brain Aneurysms	<input checked="" type="checkbox"/> YES	NO
10. Testicular Cancer	YES	<input checked="" type="checkbox"/> NO
11. Enlarged Prostate	YES	<input checked="" type="checkbox"/> NO
12. Ulcers	<input checked="" type="checkbox"/> YES	NO
13. Cancer of the Cervix (Cervical Cancer)	<input checked="" type="checkbox"/> YES	NO
14. Irritable Bowel Syndrome (IBS)	YES	<input checked="" type="checkbox"/> NO
15. Fertility Problems	<input checked="" type="checkbox"/> YES	NO
16. Impotence (Erectile Dysfunction)	<input checked="" type="checkbox"/> YES	NO
17. Brain Tumors	YES	<input checked="" type="checkbox"/> NO
18. Renal Failure	YES	<input checked="" type="checkbox"/> NO
19. Osteoporosis	<input checked="" type="checkbox"/> YES	NO
20. Diverticulitis	YES	<input checked="" type="checkbox"/> NO

About the Author

Jennifer E. Irvin received a Bachelor's Degree in Psychology from The University of Florida in 1994 and a M.S. in Clinical Psychology from The University of Central Florida in 1997. After completing her Master's degree, she entered the Ph.D. program in Clinical Psychology at the University of South Florida in 1997.

While in the Ph.D. program at the University of South Florida, Ms. Irvin coauthored several publications in peer-reviewed journals and presented her work at national meetings. She completed her Internship at the Brown University Clinical Psychology Training Consortium within Brown Medical School. Ms. Irvin has received support from the National Cancer Institute to continue her training and research on smoking and risk perception and looks forward to starting her postdoctoral fellowship at The University of Texas M.D. Anderson Cancer Center.