

Using social learning theory as a conceptual framework to examine
determinants of teen marijuana use.

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Dedication

This thesis is dedicated to my Mother, and all of my friends and colleagues who have supported me throughout the past few years, including Laura Friedenber, Anna Gierke, Brian Weeks, Beth Parilla, Erik Nelson, Tyler Simmers, Stacy Kaye, Kennedy Sharp and Hannah Radant.

Abstract

The present research assesses determinants of teen marijuana use. It uses social learning theory as a conceptual framework to examine the impact of sensation seeking, usage status, interpersonal communication, social networks, and media use on attitudes about marijuana and intention to use among teens. Results show significant main effects and mediation effects for many of these variables. Results are discussed in terms of their contribution to both the literature and future antidrug campaigns.

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Chapter 1: Introduction

The aim of the present research is to examine teens' attitudes and intentions about marijuana use as a function of cognitive, environmental, and behavioral factors. In doing so, the research uses social learning theory (Bandura, 1977) as a conceptual framework to investigate how these factors may impact attitudes and intentions to use marijuana--both as main effects and through their reciprocal influence on one another. Importantly, the research looks at these relationships in part through an examination of teens' interactions with media content and their interpersonal communication within their social networks.

Research on teen drug use often focuses on responses to specific antimarijuana campaigns. Stephenson et al. (1999) assess the effectiveness of antimarijuana ads targeting high sensation seekers. David et al., (2006) focus their research on unintended effects of conversation to specific antimarijuana content. Throughout the literature, there is a paucity of research looking at how teens interact with marijuana content in the general media environment. Given that antimarijuana campaigns are only one in a myriad of influences that impact attitudes and intentions, it seems short-sighted to remain strictly at this level of analysis. Thus, the present research seeks to investigate teen marijuana use within teens' overall media and social climate, rather than within the confines of reactions to specific campaigns, in hopes of gaining a more global understanding of the issue. In assessing factors affecting teen marijuana use on a larger stage, the research also seeks to inform health educators on design and implementation issues of health campaigns embedded in the noisy media and social world teens exist in today.

Certainly, we already know a lot about teen marijuana use. However, literature within communication research assessing the causes of marijuana use among teens is often fragmentary in nature. For example, lines of research include a focus on features of the individual such as sensation seeking (Everett & Palmgreen, 1995; Palmgreen et al., 2002; David et al., 2006), or on examining unintended effects of interpersonal conversation about marijuana within teens' social networks (David et al., 2006). Though each line of research has offered important results in assessing causes of marijuana use, many of these seemingly disparate concepts may be related. That is, while one's level of sensation seeking, for example, has an effect on teens' likelihood of using marijuana, it may also impact how teens choose and interpret media content and talk with their friends about that content.

Attitude, as opposed to other determinants such as perceived norms and self-efficacy, are used in the present analysis. An individual's attitude toward performing a particular behavior is likely to be positive if that person perceives that there are positive outcomes resulting from that behavior. Using a deductive logic, favorable attitude is likely to increase a person's intention to participate in a given behavior.

A review of the literature shows that attitude has been consistently correlated positively with intention and a good predictor of intention (e.g. Norman et al., 2000; Rhodes et al., 2002; Symons et al., 2003; Brickell et al., 2006; Everson et al., 2007). Studies within the exercise, drinking, and drug domain consistently find attitude to be the most frequent primary predictor of intention. For instance, Hagger et al., (2007) demonstrated that attitude significantly predicted intentions for exercise, dieting, and

binge drinking. Finally, specifically for issues of sensation seeking and marijuana use, attitude was found to be the strongest predictor of intentions (Donohew et al., 1990, Donohew et al., 1994).

A review of one prominent U.S. campaign effort aimed at decreasing marijuana use among teens suggests that research on teen marijuana use is a relevant research issue because of the effort and money spent at trying to prevent use. Importantly, the paper's focus is not on campaigns, but on behavior within a larger arena. A brief look at U.S. campaign efforts, however, offers important background information on why teen marijuana use is a worthwhile issue to explore in communication research.

Despite considerable effort and expense, marijuana use in the United States persists. Just over forty percent of Americans (97.5 million) age 12 and older report lifetime marijuana use, and roughly six percent report use in the past month (14.6 million) (National Survey on Drug Use and Health, 2005). Lifetime and past-year marijuana use rates among 8th and 10th grade students have remained relatively stable over the past 5 years (Johnston et al., 2003). Marijuana use continues to remain steady despite the fact that the United States has allocated billions of dollars to fight the problem (Hornik et al., 2001). Though marijuana use among teens has shown no signs of decreasing (Hornik et al., 2001), this has not prevented the United States from allocating a great deal of money to attempt to curtail it.

The National Youth Anti-Drug Media Campaign (NYADMC) provides one example of a heavily financed campaign. The NYADMC was a \$1 billion dollar initiative funded by Congress to reduce and prevent drug use among young people by addressing

youth directly and by encouraging their parents and other adults to take actions known to affect youth drug use. The major intervention components included television, radio, and other advertising, complemented by public relations efforts including community outreach and institutional partnerships.

Certainly, teen marijuana use is an issue that has garnered a great deal of attention from government organizations and health practitioners. Additionally, because of the lack of success of these campaigns (Hornik et al., 2001), there has been a great deal of research assessing why campaigns fail (Hornik et al., 2001; Hornik, 2003; Stephenson et al., 1999; David et al., 2006).

To gain a clearer understanding of the many influences that cause teens to initiate, and persistently use marijuana, we must look beyond the impact of specific campaigns. We would be naïve to assume that teens exist in a media vacuum in which the content presented to them in an antimarijuana campaign single-handedly causes them to use, or not use, marijuana; and thus both the negative and positive effects of the campaigns must be taken with caution. Before teens are ever exposed to these campaigns, they have formed attitudes about marijuana through dispositional features, past use, peers etc. Though at times fragmentary in nature, communication research in many of these areas helps shed light on how each of these influences affects teens' attitudes and intentions toward using marijuana.

The present research uses social learning theory as a conceptual framework to review three heavily researched areas that represent the three main components of SLT: cognition (sensation seeking), environment (interpersonal communication, social

networks, media use) and behavior (past use). Research in these three areas is particularly compelling due to both the frequency of exploration, and the amount of variance each of these areas explains related to teen marijuana use. Furthermore, in line with SLT, there is reason to believe many of them may be complementary in explaining teen marijuana use. For example, cognitive influences, such as level of sensation seeking, may impact attitudes about marijuana through an increase in likelihood of use. It may also impact the type of media high sensation seekers seek out. Due to a preference for higher levels of stimulation, high sensation seekers may prefer media that features more stimulating content, such as drug use. Increased exposure to such content may then act as an additional influence on attitude formation. Here we can see how cognitive factors (sensation seeking) and environmental factors (media) may act in a complementary fashion in informing attitudes. In focusing on how these factors work together to inform attitudes, rather than as separate entities, the present research attempts to integrate these factors within a single research design. SLT, through its focus on how behavioral, cognitive, and environmental factors influence each other, provides a nice conceptual framework to do so.

Chapter Two: Literature Review

Social Learning Theory

Though research on dispositional, environmental, and behavioral factors all offer promising results in investigating teens' attitudes toward marijuana, they may be complementary in informing attitudes and intentions. That is, many of these causes may act together in informing attitudes about marijuana and intention to use. Attempting to incorporate them within a single framework, then, appears to be a worthwhile pursuit. Doing this allows investigators to examine potential mediating relationships within a single research agenda. SLT provides a conceptual framework within which this can be achieved.

Next, SLT is reviewed and discussed within the context of how each of its three main factors-cognition, behavior and environment-are represented by the variables and constructs used in the present research. This is followed by a discussion of how we might expect many of these ideas to influence each other.

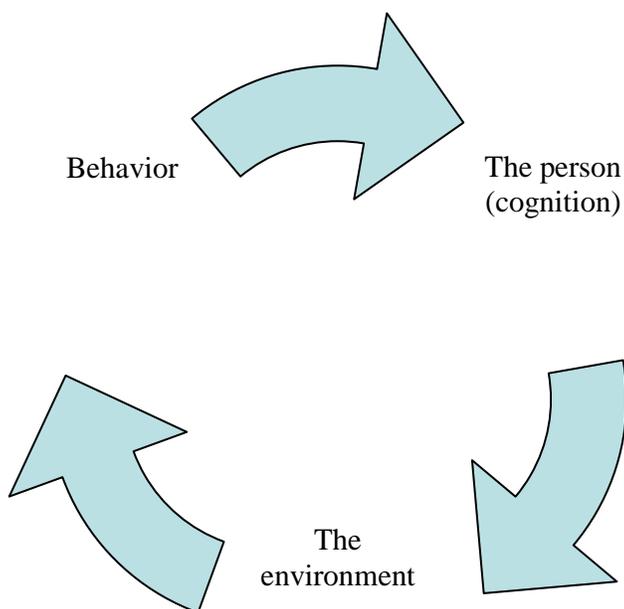
It is important to note that this research does not seek to directly test SLT. Rather, it seeks to use it as a conceptual framework to emphasize the importance of looking at how variables representative of cognition, behavior, and environment that have been used in past research on teen marijuana use may impact each other as outlined in SLT. Thus, what follows next is a discussion of why and how we might expect these variables to intersect.

Social Learning Theory-3 Main Components

Social learning theory (Bandura, 1986) represents a general theory of behavior that attempts to synthesize principles of learning with those of cognitive psychology. It is a systematic effort to explain how the social and personal competencies that are often referred to as “personality” develop from the social context in which such learning occurs (Hilgard & Bower, 1975, p. 599).

SLT views one’s behavior as the result of cognitive, behavioral and environmental factors. Through “triadic reciprocity”, these three factors together guide behavior.

Figure 1: *Interplay among the person, his or her behavior, and the environment as an illustration of reciprocal determinism.*



Cognition

Bandura (1977) suggests that human behavior is not simply a result of antecedent inducements and response consequences, but rather that most external influences affect behavior through intermediary cognitive processes. As Bandura (1977 p 160) explains “cognitive factors partly determine which external events will be observed, how they will be perceived, whether they leave any lasting effects, what valence and efficacy they have, and how the information they convey will be organized for future use.”

Bandura’s (1977) discussion of cognition focuses primarily on thought processes. That is, how we interpret and make sense of the world around us (environmental factors) varies depending on a number of cognitive factors, such as the symbolic meaning we give external stimuli and the motivations we cognitively initiate to perform certain behaviors due to their implications for future outcomes.

Bandura (1977) suggests that thoughts about external events occur in the form of symbolic constructions. Symbols provide the instruments of thought; internal representations of experiences serve as important sources for the symbolic constructions which constitute the thoughts. For example, after learning the basics of subtraction through the physical process of subtracting two objects from a group of ten so that eight remain, we are able to use those experiences as symbols such that we can cognitively perform subtraction without the physical presence of objects.

The capacity to represent future consequences in thought provides one cognitively based source of motivation. Bandura (1977) suggests that cognitive representations of future outcomes function as current motivators of behavior. For example, a graduate

student's cognitive representation of the benefits of finishing a Master's thesis may motivate him to spend the weekend in the library as opposed to at the bar. A second cognitively based source of motivation operates through the intervening influences of goal setting and self-regulated reinforcement. Once an individual engages in the cognitive act of goal-setting, and self-satisfaction is determined in part by achievement of this goal, behavioral outcomes are influenced as a result of the motivation to achieve the specific outcome. If a tennis player's goal is to become the best player on his or her team, for example, he or she becomes less likely to achieve self-satisfaction until this goal is accomplished, resulting in an increased likelihood in behavior aimed at achieving this goal—such as extra practice time and increases in conditioning. The way we cognitively process these external stimuli, in turn, has implications for behavioral outcomes. SLT suggests that environmental events provide the individual with information that is cognitively processed, and the results of that processing determine the overt behavior that will follow (Maisto et al., 1999). A major piece of information that individuals glean from the environment is the probable consequences for enacting a behavior in a given setting. Thus, the expectancies of behavioral outcomes that are acquired play an important role in guiding later behavior.

Social learning theory discusses cognitions in the context of thought processes, with less of a focus on the explicit individual difference variables that help govern those thought processes. The present research focuses on how individual difference variables may have profound effects on how the thought processes themselves are performed. Let's examine Bandura's (1977 p 160) quote again: "cognitive factors partly determine which

external events will be observed, how they will be perceived, whether they leave any lasting effects, what valence and efficacy they have, and how the information they convey will be organized for future use.”

One relevant individual difference variable is sensation seeking. Zuckerman (1994, p 27) defines sensation seeking as “the need of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experiences.” How might a teen’s level of sensation seeking affect the observation and perception of external events? First, let’s look at it in terms of motivation. Is it possible that because of differences in level of needed stimulation necessary to achieve baseline levels of arousal, high sensation seekers may be motivated to experience different kinds of external stimuli (such as television programs) than low sensation seekers? The activation model of information exposure (Donohew et al., 1998) suggests that they may be engaging in these kinds of processes. The theory proposes that individuals have an optimum level of activation or arousal at which they feel most comfortable, and that they expect to achieve or maintain this optimum level of arousal in information exposure situations (Donohew et al., 1980; Donohew et al., 1998). Furthermore, in terms of goal-setting, high sensation seekers may be more motivated to place a higher priority on thrill-seeking behavior, such as drug use, because of the necessity of engaging in such behavior to satisfy biologically-driven demands.

Here, we see how sensation seeking may impact motivation and cognition. While certainly other factors also impact cognition, sensation seeking is used in the present study as the sole representative of cognition because of its high relevance to teen

marijuana use. Given the consistency with which sensation seeking has been found to predict marijuana use (Forsyth & Hundleby, 1987; Martin et al., 2004; Newcomb & Felix-Ortiz 1992), differences on this trait are likely to have a significant impact on motivation related to marijuana use.

Again, the research does not aim to be a direct test of SLT. Rather, it seeks to incorporate relevant variables that previous literature has shown to be important in affecting attitudes and intentions and that represent each of the three components of SLT. While many factors influence motivation related to marijuana use, sensation seeking is an important one that likely shapes motivation in a number of ways.

Furthermore, in incorporating an individual difference variable into SLT, the research moves beyond SLT's general notion of cognition in examining how specific dispositional traits influence cognitive representations. In doing so, the research seeks to increase the specificity in which we can think about cognition in relation to SLT. Thus, while we may be losing information in making one individual difference variable the sole representative of cognition in SLT, we are also gaining information in thinking not just about how motivation may impact behavior, but also what factors account for motivational differences in the first place.

The symbols sensation seekers attach to environmental stimuli may also differ. Because of the satisfaction associated with drug use, for example, high sensation seekers may form different symbolic constructions of drug related content than low sensation seekers. These symbolic constructions, of course, then may impact the perceptions of drug content seen in external venues such as the media and teens' social networks.

In sum, Bandura's (1977) notion of cognition as an execution of thought processes represents the first of the three intervening factors in social learning theory. Cognitively based motivation and symbolic construction represent two ways in which we can see how these thought processes play out within an individual. Though individual difference variables such as sensation seeking receive less attention in social learning theory, they can be seen as part of cognition in how they help shape the very nature of the thought processes themselves.

Environment

Bandura (1977) suggests that through learning experiences, environmental stimuli acquire the capacity to activate and guide behavior. That is, as people learn to correlate certain outcomes associated with environmental stimuli, they can regulate behavior such that these environmental stimuli are either sought out to produce pleasure, or avoided to reduce pain. For example, driving through a busy intersection on a red light will have very different consequences than crossing on a green light, and these cues serve as activators and guides for action.

People fear and avoid things that have been associated with aversive experiences, but like and seek those that have had pleasant associations. Bandura (1977) suggests that a great deal of human behavior is activated by events which become threatening through association with painful experiences. That is, due to their implications for survival, we are quickly able to interpret environmental events that may harm us and guide our

behavior to avoid them. Similarly, because pleasant stimuli satisfy our needs for pleasure, they too guide our behavior, in the opposite direction.

In the case of teen marijuana use, we can see how the present study's variables of interest represent environmental stimuli, and how these environmental stimuli may guide behavior. Media use represents one feature of the environment. Teens interact constantly with media in their overall environments, from watching television and using the internet to reading magazines at doctor's offices and reading billboards on the way to school. Exposure to specific types of media (for example positive representations of marijuana in many teen-oriented movies), may have an influence on how teens view marijuana and consequently whether they view it as a behavior to be sought out, or avoided.

Bandura (1977) discusses this idea in terms of vicarious learning or modeling-- the idea that humans may acquire new behaviors through observation of others, or through communication by symbolic means such as spoken or written language—such as the mass media (Bandura, 1977, 2001). SLT posits that observation of a model being reinforced for a given behavior can increase the likelihood of that behavior in the observer, just as observation of behavior that results in punishment can cause avoidance of that behavior.

Features of the environment at the interpersonal level--such as conversations with peers and the makeup of social networks--may also guide behavior. Positive talk about marijuana among peers and a social network that elicits strong positive attitudes about marijuana may act as attitudinal and behavioral guides for seeking out or avoiding marijuana.

In sum, we can see how features of the environment can guide behavior through associating stimuli from the environment in positively or negatively valenced terms. In the present study, media use, interpersonal conversation and social networks are three variables that represent environmental stimuli teens' encounter daily, and through varying interpretations of these stimuli can guide both approach and avoidant behavior.

Behavior

Bandura (1977) explains that people do not, of course, act only on the basis of environmental cues, ignoring the results of their actions. Rather, behavior is extensively regulated by its consequences. That is, responses that result in unrewarding or punishing effects tend to be discarded, whereas those that produce rewarding outcomes are maintained.

People are not merely reactors to external influences. Rather, they are also guided in part by the consequences of their behavior in different conditions, a process Bandura (1977) refers to as reinforcement. If teens' past behavior with marijuana elicits mostly positive reinforcement out of using marijuana, the behavior is likely to be repeated.

The implication for the present study, then, is fairly straight forward. Though environmental stimuli serve as a source of informing attitudes and guiding behaviors about marijuana, so too does past behavior. No matter how many times a teen is exposed to antimarijuana messages, if their past behavior with marijuana suggests only pleasurable outcomes, attitudes and behavioral patterns are likely to be maintained.

Therefore, social learning theory suggests that in addition to cognitive and environmental factors, we must also consider behavior as a relevant informant.

Triadic Reciprocity

Important for this study's investigation of cognitive, environmental, and behavioral predictors of attitudes and intentions about marijuana is SLT's idea of "triadic reciprocity". Bandura (1977) also refers to as *reciprocal determinism*--the idea that cognitions, behavior and environment are seen as "interlocking" determinants of each other (Bandura, 1977). For example, behavior may be controlled by the environment, but that behavior may also alter the environment. In this context, reciprocal means mutual action between factors that are seen as causal, and determinism means the production of effects by certain factors (Bandura, 1986).

Bandura (1977) states that because personal, behavioral and environmental sources of influence function as interdependent rather than separate determinants, research aimed at estimating what percentage of behavioral variation is due to persons and which to behaviors or situations does not throw much light on the interactive aspects of regulatory processes. Rather, to elucidate the process of reciprocal interaction between factors, one must analyze how each is conditional on that of the other.

Bandura (1977) uses the example of humans' ability to cope with stress as an example of the interaction between cognition and environment. Every day, individuals must cope with stress, which may be viewed as environmental events that present challenges to, or make demands on, individuals. Cognitive processes help individuals

cope with stress from their external social environment. One example of this is the use of self-regulatory functions. Individuals are capable of arranging environmental incentives, producing cognitive supports, and generating consequences for their own actions, and thus exert a degree of control over their own behavior (Maisto et al., 1999). To extend the analogy to behavior, people may assess how the consequences of past stress-coping behavior, such as drinking alcohol, impacted environmental factors such as level of production at work in forming attitudes about future behavior.

It is through the idea of reciprocal determinism that the present study seeks to explore teen marijuana use. SLT is used as a conceptual framework to identify relevant cognitive, environmental, and behavioral variables, and test how they may influence attitudes and intentions about marijuana both as main effects and in mediation models.

Next, we take a closer look at applying SLT's idea of reciprocal determinism to teen marijuana use.

Cognitive Factors and Marijuana Use

The present research focuses on sensation seeking because of its substantial focus in the literature on teen marijuana use and the significant relationship it is found to have with drug use in a large number of studies. Given the consistency with which sensation seeking has been found to predict marijuana use (Forsyth & Hundleby, 1987; Martin et al., 2004; Newcomb & Felix-Ortiz 1992), and the role it plays in teens' interpersonal communication about marijuana (David et al., 2006) and media preferences (Everett et

al., 1995), it appears to be an ideal representation of the distributional attributes represented in SLT.

A large body of literature suggests that a number of different dispositional traits may be associated with increased drug use. These include impulsivity (McMillen et al., 1992; Schall et al., 1992), aggression (Abrams & Wilson, 1982), and self-esteem (Donovan & Marlott, 1982; Lee & Oei, 1993). Though there are a number of dispositional features that have been shown to impact teen marijuana use, a large number of studies have found sensation seeking to be a primary dispositional attribute that has been positively related to amount and frequency of drug use (Martin et al., 2004; Newcomb & Felix-Ortiz 1992;) and heavy alcohol use (Parent and Newman, 1999; Zuckerman & Kuhlman, 2000). Furthermore, a number of studies have found sensation seeking to be the personality trait most often associated with heavy alcohol and drug use among teens and college students (Forsyth & Hundleby, 1987; Schall et al., 1992).

Zuckerman (1994, p 27) defines sensation seeking as “the need of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experiences.” Zuckerman (1994) suggests that persons differ reliably in their preferences for or aversion to stimuli or experiences with high arousal potential. In comparison to those reporting low sensation seeking, high sensation seekers would be likely to experience pleasure from activities such as riding a roller coaster, bungee jumping, and risky driving (Roberti, 2004; Zuckerman, 1994). Activities such as these provide sensation seekers with the stimulation necessary to achieve a preferred level of arousal. Sensation seeking is

believed to have a biological basis, with an individual's default levels of dopamine mediating biological influences on our personality (Netter & Rammsayer 1991; Rammsayer 2004). Thus, one's tendency to seek sensation can be traced to their levels of dopamine in the brain. High sensation seekers have lower default levels of dopamine and therefore a higher level of optimal stimulation and arousal. Recently, scholars have suggested that sensation seeking may be partially heritable (Hur & Bouchard, 1997; Koopmans, van Doornen & Boomsma, 1997).

Environmental Factors and Marijuana Use

A second line of research related to teen marijuana use examined how environmental factors –namely interpersonal communication and social network patterns– influence attitudes and intentions about marijuana use. Though a number of different environmental factors have been shown to affect teen marijuana use, recent work in these two areas offers compelling results. David et al., (2006) found that unintended effects of conversation could have a negative impact on how marijuana content in the media is diffused within teens' social networks, and consequently impact their attitudes and intentions. Visser and Mirabile's (2004) work suggests that the congruency within teens' social networks can affect individual level attitude strength, and how susceptible one is to attitude change.

Interpersonal Communication

One of the primary goals of many health campaigns is generating interpersonal communication among targeted groups about campaign topics (David et al., 2006). By

generating interpersonal communication, the campaigns hope to diffuse message content to targeted groups. The rationale being that by stimulating talk, exposure of campaign ideas will increase among a given population.

The present research focuses on interpersonal communication as an environmental factor that informs attitudes about marijuana because of its implications for information diffusion. It may be the case that teens talk about the content they see in their general media environments in much the same way that previous research has shown them to talk about campaign content. If a teen is exposed to an antimarijuana campaign on television, and then discusses the ideas presented in that commercial to members of his social network, the content of that campaign is diffused to his peers. But, does the same diffusion of ideas also happen when he or she is watching a movie featuring marijuana use, or playing a video game that involves using drugs? Interestingly, little research has examined whether the same mechanisms that have been shown to occur in response to campaigns also occur in response to content in teens' general media environments. Thus, exploring interpersonal communication about content in teens' general media environment is a relevant next step to this line of research. A look at how researchers tend to think about interpersonal communication, the mechanisms through which it exerts influence, and research on its use in campaigns provides necessary background information for its inclusion as a useful environmental factor in the present research.

As Southwell and Yzer (2007) note, defining what is interpersonal communication is difficult. Southwell and Yzer (2007) suggest that coming to a unique

definition of interpersonal communication is unlikely, but that two key characteristics of interpersonal communication are that it is a consequential behavior and that it occurs in diverse contexts. Southwell and Yzer (2007, p.423) suggest that “we regard conversation not just as simple information delivery between people but rather as relationally and socially consequential behavior, albeit sometimes in response to evolving circumstances as conversations unfold.” Furthermore, these conversations can occur in contexts other than face-to-face interactions, such as those seen in chat and email exchanges on the internet.

In Rogers’ (1962) early work on diffusion of innovations, he suggested that activating communication networks about an issue can help to diffuse the concept, product, or behavior within the communication network. In *The Anatomy of Buzz*, Rosen (2002) makes the same about the role of interpersonal communication in the diffusion of innovations. In their review of the role of interpersonal conversation in mass mediated campaigns, Southwell and Yzer (2007) note previous studies show that conversation can play an important role in information or knowledge diffusion.

Several studies in political and science communication demonstrate that discussion about a topic predicts knowledge. Researchers in political communication found that frequency of discussion predicted knowledge about that topic, even after controlling for various news media use variables (Eveland et al., 2005, Holbert et al., 2002). Powell et al. (2007) found that interpersonal conversations about fish contamination predicted higher reported perceived knowledge about the topic, and

Stamm et al. (2000) found that interpersonal conversation about global warming predicted a higher understanding of the causes, effects and solutions of global warming.

Recent work in marketing suggests that in the past decade, generating word-of-mouth among consumers has become a primary objective among marketers (Bowman & Narayandas, 2001; Liu, 2006). Keller & Berry (2003) suggest that traditional advertising does not reach the target audience with the same effectiveness and that generating conversation has become an increasingly useful and necessary channel among marketers and should continue to grow in importance.

Eveland (2004) provides a compelling theoretical rationale for how discussion contributes to knowledge diffusion. He argues that discussion can influence knowledge gain through three distinct routes. The first is based on the two-step flow of communication (Katz and Lazarsfeld, 1955), or the “exposure” explanation, suggesting that conversation with others acts as an additional opportunity for exposure. In this case, conversation can provide opportunities for exposure to messages for people less likely to be exposed to the messages themselves. The second is the anticipatory elaboration explanation, which suggests that people will more actively gather and process information from a mass mediated campaign if they anticipate future conversation with others about campaign content. Here, people are more likely to seek out and more fully process anti-drug information if they feel they are likely to have conversations about it in the future. The third route, the discussion-generated elaboration explanation, suggests that elaboration occurring at the time of discussion can enhance the level of people’s

knowledge. The implication in this situation is that through elaboration and correction of relevant topics people will develop more elaborate and nuanced knowledge of the topic.

Kelly et al. (1992), attempted to generate interpersonal communication by targeting opinion leaders. They found evidence that so-called popular people often served as network hubs in urban homosexual communities and thus potentially could assist with the endorsement and spread of prevention and risk information. The NYADMC attempted to stimulate conversation about drug use among adolescents both with other adolescents and with parents (Hornik, 2003). One of their stated goals was encouraging parents unwilling or unsure of their abilities to talk about drugs to engage in interpersonal conversations with their children. A number of other health related campaigns have attempted to stimulate conversations such as campaigns related to HIV/AIDS prevention and organ donation (Afifi et al., 2006; Svenkerut et al., 1998).

The above discussion provides background information on the relevance of interpersonal communication as a factor that can potentially influence attitudes through its ability to act as a conduit to diffusing information about marijuana. The present study focuses on interpersonal conversation about content seen in teens' general media environments. However, while there exists obvious benefits from generating interpersonal communication through messages in the media environment, there may be unforeseen consequences as well. This is where attention is turned to next.

Unintended Outcomes

Teens do not encounter media content with a blank slate. Rather, what content they attend to, how they process it, and how they talk about it are all shaped by their unique individual makeup, and the makeup of the worlds in which they live. Thus, to expect teens to talk about media content in the ways message designers may intend them to seems unrealistic. To any reasonable, educated person, for example, a viewing of the racist film *Birth of a Nation* would likely result in conversation about its message in very different ways than the film's director intended. The present research focuses on how this phenomenon might occur for the marijuana content teens' experience in their media environments. In other words, how do cognitive factors, such as sensation seeking, and environmental factors, such as media content and social networks, impact the way marijuana content is discussed among teens.

Recent work by David et al. (2006) has begun to examine the potentially deleterious effects of interpersonal conversation for campaign content. David et al. (2006) focused their research on examining two factors: negative social comments in response to a campaign or other intervention; and the potential situations where social influence can be followed and where negative comments may be likely. Participants were adolescents who viewed anti-marijuana ads and then either did or did not participate in an on-line chat with peers about the ads. The group interactions about antidrug ads lead to negative effects such that those who chatted reported more promarijuana attitudes and subjective normative beliefs than those who just viewed the ads and did not participate in the chat.

David et al. (2006) outline a four-step model for social influence in which potentially deleterious effects can occur. Step 1 is message exposure, necessary for social influence to occur.

Step 2 is the generation of positive and negative thoughts about a message's themes. The two factors primarily responsible for whether the thoughts are negative or positive are argument strength and biased processing. Petty and Cacioppo (1986) define strong arguments as those that generate more favorable than unfavorable thoughts; with the opposite being true of weak arguments. Biased processing refers to prior attitudes and dispositions of receivers in the target audience leading them to favor (or oppose) claims in messages before centrally processing the message (Petty & Cacioppo, 1986). ELM posits that when the topic is of personal relevance, messages are more likely to be centrally processed; and evidence suggests that as involvement increases, argument quality becomes a more important determinant of attitudes after message exposure (Burnkrant & Unnava, 1989; Petty & Cacioppo, 1979).

Step 3 of David's et al., (2006) model assumes that a member of the target audience has either favorable or unfavorable thoughts and is presented with the opportunity to express those thoughts to members of his or her social network. They argue that individual differences in expressiveness, the communicator's perception of whether his or her opinion is in the majority or minority and how accurate that opinion is are three primary factors affecting expression of thoughts.

Step 4 assumes that once an opinion is expressed-either positive or negative-it can have a variety of possible effects on beliefs about the particular behavior (Fishbein et al.,

2002). David et al., (2006) suggest that in groups of adolescents, minority influence can occur due to a confluence of three factors: The group seeks to find some opinion agreement, the opinion minorities hold special competence or status, and the majority perceives the minority either as similar to themselves or as part of a favorably viewed social group.

Results of the David et al., (2006) study support their four-step model. Groups that discussed antidrug ads held more promarijuana attitudes and intentions than groups that did not. Second, exposure to social interactions affected factors related to behavioral intentions. In sum, the research demonstrated that antidrug messages that promote peer discussion can lead to significant deleterious and unintended effects.

The question remains, however, whether the same effects that are seen in specific antidrug messages and campaigns occur in teens' general media environment. That is, do teens absorb media content through television, internet etc. and talk about them within their social networks in ways that promote deleterious effects? The present study, therefore, seeks to explore how teens engage with media, and how their individual, behavioral and environmental makeup affects how they talk about the content with peers. Given that this has only been explored in a controlled setting and in response to specific campaign content, doing so within teens' general media environment is a relevant next step to take.

Social Networks and Attitudinal Congruence

Another environmental factor relevant to looking at teen marijuana use is attitudinal congruence within teens' social networks. Attitudinal congruence, in the context of social networks, refers to the extent to which groups uniformly share similar views on a particular issue. Adolescents in attitudinally congruent social networks differ in attitude strength from those in attitudinally heterogeneous networks—networks made up of people who hold a range of views, some with which they agree and others with which they disagree (Visser & Mirabile, 2004). Using a sample of young people, they found that individuals embedded within congruent social networks were more resistant to attitude change than were those embedded within heterogeneous social networks. They posit that congruous social networks may increase attitude strength by decreasing attitudinal ambivalence and increasing the certainty with which people hold their attitudes.

Social comparison theory (Festinger, 1950) provides further background on attitude formation and social networks. Social comparison theory (Festinger, 1950) posits that due to a lack of objective criteria, people assess the correctness of their views by comparing their attitudes to the attitudes of those around them. That is, the 'correctness' of one's attitudes is determined in large part by its correlation to the attitudes of his or her social network. In heterogeneous networks, social comparison theory suggests that a lack of attitude consensus on a particular issue may decrease individual-level attitude strength by reducing the confidence that people have in the correctness of their attitudes. The implication is that in comparison to those in congruent networks, individuals in heterogeneous networks will be less resistant to attitude change. Furthermore, because

those in congruent social networks create less conflict from expressing opinions than do those in heterogeneous social networks, they may be more inclined to express their views. Numerous studies have shown that publicly expressing one's views renders stronger attitudes (Brehm & Cohen, 1962; Hovland, Campbell, & Brock, 1957), and repeated expressions causes attitudes to become stronger and more extreme (Downing, Judd, & Brauer, 1992).

This has relevance for examining teen marijuana use in a number of ways. First, if teens existing in attitudinally homogenous social networks have increased strength in the certainty of their views, those in social networks with favorable views toward marijuana are likely to hold more positive attitudes toward marijuana than those in heterogeneous social networks. The reverse would hold for those in homogeneous social networks with less favorable views towards marijuana. Second, we can see a potential relationship with sensation seeking and past use. Because high sensation seekers and drug users are likely to exist in social networks with others like them, their already positive attitudes about marijuana are likely to become further reinforced within their homogenized social networks. Third, because those in homogenized social networks have increased attitudinal certainty, these groups should be less resistant to persuasive appeals in the media that go against their preexisting beliefs. For example, the teen existing in a homogenized social network with promarijuana beliefs should quickly counter argue messages not in line with his or her views.

To summarize, attitudinal congruence within teens' social networks is used in the present study as a representation of an environmental factor that may shape attitudes

about marijuana. Insofar as differences in the congruency of social networks affect attitudes in general, we can expect this effect to occur expressly for issues of marijuana use, and examining these differences as a function of cognitive (sensation seeking) and behavioral (past use) factors further parses out conditions under which attitudinal congruence may act in accord with other relevant variables.

Behavior and Marijuana Use

Past behavior is another useful variable in attempting to explain intention to use marijuana. A number of studies have shown that past behavior typically predicts intention to perform a future behavior, though a weaker relationship exists for past behavior and attitude (Falomir & Invernizzi, 1999; Hu & Lanese, 1998; Willemson, de Vries, van Breukelen, & Oldenbrug, 1996; Moan & Rise, 2005).

Research on past behavior as an indicator of future behavior helps explain the strength of the relationship. Bargh & Chartrand (1999) suggest that when a particular goal-directed behavior is repeated frequently and consistently in a similar situation, with positive reinforcement, it eventually becomes automatic or habitual. The execution of habitual behavior requires less conscious attention, decision-making processing, and deliberate reasoning than nonhabitual behaviour (Aarts, Verplanken, & van Kippenberg, 1997; Verplanken, Aarts, & van Kippenberg, 1997;).

Habitual behavior appears to be under the control of automatic or unconscious cognitive processes (Aarts & Dijksterhuis, 2000; Aarts, Verplanken, & van Knippenberg, 1998), and once habitual, can be automatically elicited by environmental cues without

conscious guidance (Bargh & Chartrand, 1999). Based on the reasoning that frequent repetitions of behavior lead to the development of a habit (Aarts et al., 1998), habit strength is commonly assessed by a measure of self-reported frequency of past behavior (Bagozzi & Kimmel, 1995). The more frequently behavior is performed in the past, the more behavior is assumed to be habitual.

Extending the Research to Teens' Overall Media Use

Work by Stephenson et al., (1999), David et al., (2006), Visser & Mirabile (2004) and others suggests a number of relevant factors in understanding determinants of marijuana use. The present research seeks to extend this work by examining how adolescents consume drug content within their general media environment, and how their consumption of this content may affect attitudes and intentions about marijuana. Before a specific campaign ever reaches adolescents, they are likely exposed to hundreds of pro and antidrug messages in their media environment-through television programs, websites, music, etc. Just as attitudes and intentions may be swayed by consuming and talking about specific antidrug campaigns, adolescents are likely to do the same for marijuana content in their general media environment.

The mass media are a primary source of health information in general (James et al., 1999; Johnson, 1997; Meissner, Potosky & Convissor, 1992), and with respect to marijuana use in particular (Hornik, 1991; Stryker, 2003). Indeed, there is evidence that exposure to positive or negative media health content is associated with increased and

decreased initiation of that behavior (Jones, Beniger & Westoff, 1980; Pierce & Gilpin, 1991).

However, despite the importance of the mass media in providing information and affecting beliefs about marijuana, little research exists examining how adolescents use this information in their overall media environments, and how media use may interact with dispositional, environmental, and behavioral factors. Instead, the literature that does exist focuses primarily on how adolescents talk about and respond to specific campaigns. In this sense, we may be overlooking a large piece of the puzzle of how adolescents form attitudes and intentions about marijuana in the first place. Based on the evidence previously reviewed, there is reason to believe that many different influences impact teen marijuana use, and investigating them from a broader media focus rather than a campaign specific one informs both theoretical and practical research.

Additionally, looking at these variables from a general media perspective, rather than a campaign-specific one, may aid in helping to understand how attitudes and intentions get shaped prior to exposure to a specific campaign. Young people certainly do not exist in a media vacuum. Antidrug campaigns are only one in a myriad of messages about marijuana that they consume daily. They form attitudes and opinions about marijuana through repeated exposure to a great deal of marijuana content. Thus, for a message to exert its intended effects, it is first necessary to understand how teens seek out, consume, and talk about marijuana content in general. For example, SENTAR (sensation seeking targeting)-based campaigns have been shown to be somewhat successful in reaching high sensation seekers. SENTAR is a mass media strategy

designed to target high sensation seekers with sensation value messages (Palmgren et al., 2001; Stephenson et al. 1999). SENTAR works off the idea that high sensation seekers prefer messages with a high *message sensation value*(MSV)-the degree to which formal and content audiovisual features of a message elicit sensory, affective, and arousal responses (Everett & Palmgreen, 1995; Palmgreen et al., 2002). For example, high sensation seekers prefer television messages that are novel, dramatic, intense and exciting, while low sensation seekers prefer ads that are far less stimulating (Donohew et al., 1991).

However, if high sensation seekers tend to seek out marijuana content in the media, and talk negatively in their social networks about antimarijuana content, then drawing their attention with SENTAR campaigns displaying marijuana use in a highly negative light may be doing more harm than good. In other words, before we are able to properly design campaigns, we must first understand how adolescents operate in their media environments and social networks.

Applying SLT to Teen Marijuana Use

As the literature review up to this point suggests, research on factors related to teen marijuana use is often fragmentary in nature. Using SLT as a conceptual framework allows us to move from looking at all of these influences independently to looking at them within a single model. That is, instead of looking only at the main effects of sensation seeking, social networks and past behavior on attitudes and intentions to use

marijuana, we're able to look at how these variables may compliment each other to exert influence.

By incorporating teens' general media climates as an environmental factor, we're also able to move beyond campaign-specific research and towards a more general understanding of how teens absorb and manipulate their overall media climates—with antimarijuana campaigns being just one influence in a noisy and chaotic world.

Sensation Seeking and Interpersonal Communication

Because high sensation seekers are more likely to engage in both early onset and regular use of illicit drugs (Hornik et al., 2001; Palmgreen et al., 2001), they are more likely than low sensation seekers to be biased in favor of promarijuana and against antimarijuana messages, and messages that suggest avoiding drug use in general. Stephenson and Palmgreen (2001) found a strong positive association between sensation seeking and perceived personal involvement with marijuana, and greater personal involvement with marijuana was associated with an increase in negative processing of antimarijuana messages. Thus, even in the face of strong arguments against marijuana use, biased processors are more easily able to generate negative thoughts about message content. The implication for high sensation seekers, then, is that they are much more likely to generate negative thoughts about antimarijuana content—as they will engage in biased processing about the content and be more likely to counter-argue arguments against marijuana use.

Here, we see the cognition-environment-behavior relationship outlined in SLT.

Because high sensation seekers are more likely to have had a behavioral history with marijuana, they engage in different cognitive processes for the marijuana content they see in their media environment than do low sensation seekers. The level of one's sensation seeking, in essence, colors their relations with external environmental stimuli. Thus sensation seeking affects behavior in terms of a higher likelihood past use, which in turn affects the cognitive processes used to process environmental stimuli.

H1: High sensation seekers will have more favorable attitudes toward marijuana and stronger intention to use.

H2: High sensation seekers will have a greater frequency of past marijuana use.

The cognition-behavior relationship can exert influence beyond just the individual. High sensation seekers are likely to cognitively process antidrug content in their environment in an unfavorable way (David et al., 2006), and this, combined with a behavioral history of marijuana use is likely to cause more favorable attitudes about marijuana and higher intention to use. However, high sensation seekers are also likely to express their opinions about marijuana content to members of their social network.

In comparison to low sensation seekers, high sensation seekers are more talkative and assertive, interact more with dissimilar others, and are more willing to express their opinions directly. Zuckerman and Link (1968) suggest that high sensation seekers use

others primarily as an audience, and tend to dominate discussions. Hwang and Southwell (2007) found that even after controlling for perceived relevance and favorable attitudes, high sensation seeking predicted conversations about science. Furthermore, because adolescents tend to believe that more of their peers use marijuana than is actually the case (Partnership for a Drug-Free America, 2000), there exists a strong possibility that those most biased against antidrug messages (high sensation seekers) may incorrectly believe they are in the majority and those in the true majority (low sensation seekers, non-users) may incorrectly believe they are in the minority. Thus, not only are high sensation seekers most likely to express their negative thoughts about antimarijuana content because of individual differences in expressiveness, but also because of a belief by all members in their social network that they own the majority opinion. The likelihood, then, of expressed negative beliefs about antimarijuana content from high sensation seekers to relevant others appears high.

Results of the David et al., (2006) study found that high sensation seekers held more favorable attitudes toward marijuana and stronger intention to use, and communicated more to their peers in group-chat situations. Furthermore, groups that discussed antidrug ads held more promarijuana attitudes and intentions than groups that did not. Thus, high sensation seekers were more likely to generate negative thoughts about the ads due to biased processing, and were more likely to communicate these thoughts to relevant others. Finally, exposure to social interactions with high sensation seekers affected factors related to behavioral intentions. In sum, the research demonstrated that antidrug messages aimed at high sensation seekers that promote peer

discussion can lead to significant deleterious and unintended effects, particularly among the segment of the population most likely at risk.

The David et al., (2006) study demonstrates nicely the cognition-environment-behavior interaction outlined in SLT. High sensation seekers are likely to have a behavioral history with marijuana, and are likely to learn from their behavior (and the behavior of others) in ways that may promote the positive consequences of marijuana. Furthermore, because of an increased likelihood of past use, they are likely to have high self-efficacy in continuing to perform the behavior. These factors, in turn, affect the way they cognitively process drug content in their external environment. Furthermore, through interpersonal conversation, high sensation seekers have the potential to influence the attitudes and intentions of other members of their social networks.

H3: High sensation seekers will communicate more to their peers about marijuana content in the media.

H4: Talk about marijuana will mediate the relationship between sensation seeking and attitudes/intentions about marijuana.

H5: High sensation seekers will express more positive thoughts about marijuana and more negative thoughts about antimarijuana content in the media to their peers.

H6: Positive talk about marijuana will mediate the relationship between sensation seeking and attitudes/intentions about marijuana.

H7: Negative talk about antimarijuana content will mediate the relationship between sensation seeking and attitudes/intentions about marijuana.

The level of attitudinal congruence in one's social network represents another way in which we can see the cognition-environment-behavior relationship.

One critique of the David et al., (2006) research is that it was conducted in an experimental setting in which participants were randomly assigned to a chat group (or social network). In reality, of course, social networks can be much more homogeneous. For example, marijuana users may be more likely to talk to other users, and high sensation seekers to other high sensation seekers. Therefore, an additional topic worth considering in examining how sensation seeking affects the way adolescents cognitively process marijuana content in their environment is attitude congruence. Specifically, how adolescents in attitudinally congruent social networks-networks made up of others who uniformly share similar views on a particular issue-differ in their cognitions from those in attitudinally heterogeneous networks-networks made up of people who hold a range of views, some with which they agree and others with which they disagree.

As high sensation seekers tend to use marijuana more than low sensation seekers, and drug users tend to engage in social networks with other drug users, it seems logical to suggest that high sensation seekers may exist in more attitudinally congruent social

networks than low sensation seekers for issues of marijuana use. Importantly this suggests another way in which high sensation seekers differ in how they cognitively process marijuana content and form attitudes. Because of increased attitudinal congruence within their social networks, high sensation seekers are more likely to cognitively process environmental stimuli about marijuana in a biased fashion, as they're likely to hold strong attitudes about marijuana and receive confirmation of these attitudes from like-minded others within their social networks.

Furthermore, Bandura (1977) suggests that through the process of vicarious learning, observation of a model being reinforced for a given behavior can increase the likelihood of that behavior in the observer. Because drug users are likely to exist in congruent social networks with other drug users, observation of performing that behavior (using marijuana) is likely to increase the likelihood of the observer performing that behavior. Thus, the attitudinal congruence of high sensation seekers' social networks may influence how their cognitions interact with environmental stimuli (in the form of drug content), and how they engage in vicarious learning through modeling the behavior of those around them.

Of course, just as high sensation seekers may be more likely to exist in attitudinally congruent social networks in favor of marijuana use, one could argue that low sensation seekers may be more likely to exist in attitudinally congruent social networks with negative views of marijuana use. However, marijuana is a drug that, even among non-users, is often viewed in a somewhat positive light. For example, between 70 and 80 percent of Americans support medical marijuana (despite a lower percentage

reporting past use), and eleven U.S. states have voted for decriminalization of personal marijuana use (Earlywine, 2007). Thus, among low sensation seekers and non-users, views about marijuana are likely to be more diverse, whereas high sensation seekers are likely to have strongly positive and congruent views about marijuana.

H8: High sensation seekers will exist in more attitudinally congruent social networks for issues of marijuana use than low sensation seekers.

H9: Attitudinal congruence will mediate the relationship between sensation seeking and attitudes and intentions about marijuana.

Media Use

High and low sensation seekers may differ in how they seek out marijuana content in the media and their perceptions about this content. Insofar as high sensation seekers are more drawn to risky behavior in general and drug use in particular, it may be the case that high and low sensation seekers use different media. Remarkably, very little is known about sensation seeking and differences in use of media classes and vehicles. Assessing differences in the media classes and vehicles high and low sensation seekers use may be an additional step in explaining differences in attitudes and intentions. If high sensation seekers use different media than low sensation seekers, and are more exposed to marijuana content in general and positive marijuana content in particular, this may

shape their attitudes and intentions about marijuana, and consequently how they talk about marijuana content in the media within their social networks.

Work by Palmgreen et al., 2001 and Stephenson et al. 1999 suggests that possibilities may exist in the type of media content preferred by high and low sensation seekers. Their research suggests that high sensation seekers prefer messages with a high *message sensation value (MSV)*-the degree to which formal and content audiovisual features of a message elicit sensory, affective, and arousal responses (Everett & Palmgreen, 1995; Palmgreen et al., 2002). For example, high sensation seekers prefer television messages that are novel, dramatic, intense and exciting, while low sensation seekers prefer ads that are far less stimulating (Donohew et al., 1991). The SENTAR-based “two cities” campaign used this rationale in designing messages aimed at high sensation seekers.

An additional idea is the possibility that the media high and low sensation seekers engage with is similar, but their self-reports of the valence of marijuana content in the media and their level of exposure may differ. That is, high and low sensation seekers may seek out information selectively to match the level of personal relevance marijuana has for them. Because high sensation seekers are likely to be biased processors, they may be more likely to process and accept promarijuana content in the media, and thus report that marijuana content in the media is more favorable towards marijuana. Additionally, they are likely quick to counter-argue and reject antimarijuana messages. As discussed earlier, previous research suggests that the social networks they engage in and the ways they talk about marijuana in those networks may aide in these processes.

In this sense they may be engaging in a kind of selective memory, viewing the same media as low sensation seekers but placing greater weight in those messages in line with the relevancy of marijuana for them and possibly their usage status. Low sensation seekers may engage in similar processes for antimarijuana messages. Such a finding would suggest a selective attention hypothesis, which states that people will prefer information that is consistent with previously held beliefs together with avoidance of information counter to those beliefs. Thus, marijuana content in the media may act in a feedback loop. Because exposure to positive or negative media health content informs attitudes and is associated with initiation behaviors, high and low sensations seekers may have their attitudes about marijuana and intentions to use marijuana reaffirmed and strengthened through media exposure-even though the media they report using may be the same.

Additionally, high sensation seekers may report increased levels of exposure to marijuana content in general. This would seem to be in line with Eveland's (2004) anticipatory elaboration explanation. Because high sensation seekers may anticipate further conversation about marijuana content in the media within their social networks, they may more actively gather and process information about marijuana in the media. Furthermore, in line with the two-step flow of information (Katz & Lazerfield, 1955), high sensation seekers are more likely to talk about marijuana content in the media, presenting an additional opportunity for exposure.

R1: Do high and low sensation seekers differ in the media classes and vehicles they use?

R2: Do high and low sensation seekers differ in their self-reports of exposure to marijuana content and valence of marijuana content in the media? And if so, do these differences mediate the sensation seeking --attitudes relationship?

Past Behavior

As noted earlier, sensation seeking is a strong predictor of the use of a variety of drugs and alcohol, and earlier onset of use (Barnea et al., 1992; Farquhar et al., 1990; Murray et al., 1993). Sensation seeking has been found to be positively related to amount and frequency of drug use (Martin et al., 2004; Newcomb & Felix-Ortiz 1992) and heavy alcohol use (Zuckerman & Kuhlman, 2000).

Additionally, past use may influence environmental factors in similar ways to the impact sensation seeking has on these factors. Just as high sensation seekers may be biased processors of marijuana content in the media, teens who have used in the past may be biased in similar ways, and thus engage in similar interpersonal conversation patterns as demonstrated in the David et al., (2006) study. Additionally, past users may be more likely to seek out marijuana content in the media that presents marijuana in a more positively valenced light, as this content is more likely to be in line with their pre-existing attitudes.

Given the relationship between sensation seeking and past use, one could question using both sensation seeking and past use as separate predictors. This issue is addressed further in the results.

H10: Marijuana users will express more positive thoughts about marijuana and more negative thoughts about antimarijuana content in the media to their peers.

H11: Positive talk about marijuana will mediate the relationship between use and attitudes/intentions about marijuana.

H12: Negative talk about antimarijuana content will mediate the relationship between use and attitudes/intentions about marijuana.

R3: Do marijuana users and non-users differ in the media classes and vehicles they use?

R4: Do marijuana users and non-users differ in their self-reports of exposure to marijuana content and valence of marijuana content in the media? And if so, do these differences mediate the use—attitudes relationship?

Chapter Three: Methodology

Participants

Data for the present study were collected in a sample of 116 undergraduate students at a large Midwestern university. Participants were recruited through a departmental research experience program and received extra credit points for their participation. Participants ranged in age from 18 to 30 years ($M=19.2$, $SD=1.6$) and the majority was female (62%). The sample was split approximately in half with respect to marijuana use. Forty-seven percent of participants reported having at least once used marijuana, while 53% reported never having used marijuana.

Measures used in the present study

Sensation Seeking. To measure sensation seeking a composite of four items was used asking subjects whether they like to explore strange places, do frightening things, have new and exciting experiences, and prefer friends who are exciting and unpredictable. The response scale has 5 points ranging from *strongly disagree* to *strongly agree* ($\alpha=.791$).

Marijuana Use. A single marijuana use item was used that asked participants whether they had ever, even once, used marijuana (0=no, 1=yes).

Attitudes. Attitudes toward marijuana were assessed with eight semantic differential items. Using a 7-point response scale these items asked participants “my using marijuana even once in the next 12 months would be”: good-bad, negative-positive, harmful-beneficial, foolish-wise, unnecessary-necessary, unenjoyable-

enjoyable, stressful-relaxing, and unpleasant-pleasant. Item scores were averaged to create an attitude scale, $\alpha=.95$.

Intention. Two items assessed participants intention to use marijuana: “How likely is it that you will use marijuana, even once or twice in the next 12 months”, “I intend to use marijuana, even if it once or twice in the next 12 months.” Both items were measured using a 7-point response scale ranging from 1=unlikely to 7=likely, $r=.90$.

Media Use. Participants were asked whether and how often they used over 30 different media on an average day using a 7-point response scale (1=never, 7=very often). The media items were divided into three subgroups: general media (e.g., magazines newspapers, posters); internet (e.g., pop culture websites, academic websites); and television (e.g., news programs, music programs; see Table 1 for an overview of all media items.

If a participant reported that they used a specific media class or vehicle at least infrequently (any response other than 1), they would then be asked further questions about exposure to and valence of the marijuana content in that vehicle. This was done through a computer program in which skip patterns were written into the design such that participants would only be asked follow up questions when their responses dictated it. So, for example, if a participant responded that they browse newspapers somewhat frequently, they would then be asked the follow up questions about exposure and valence, whereas if they reported no use, no follow questions would be asked.

Exposure to Marijuana: Participants were asked how often they noticed marijuana content in each of the media items using a 5-point response scale (1=never, 5=very often).

Valence of Marijuana Content: Participants were asked “Did the marijuana you noticed on/in...(media item) present marijuana positively or negatively?” A 5-point response scale was used (1=only negative, 5=only positive).

Marijuana Conversations: Participants were asked various questions about their social networks. Participants were told that examples of such networks “are your close friends, your colleagues at work, and students in a class you are taking.” Participants were asked whether they had talked about the following topics with the three closest members of their social networks: “anti-drug advertisements”, “drug use policy”, “how the media talks about marijuana”. A 2-point response scale was used (1=yes, 2=no), with an additional N/A option.

Valence of Marijuana Conversations: Two items were used. Participants were asked: “When you talked about marijuana with your parents, friends...etc. was the conversation more positive or negative towards marijuana?” A 5-point response scale was used (1=only negative, 5=only positive). Participants were also asked how often they talk with the three closest members of their social networks about “the good/bad things that could happen if I were to use marijuana.”

Attitudinal Congruence: To measure the degree to which adolescents exist in attitudinally congruent social networks for issues of marijuana, a descriptive norm item was used. Participants were asked “how many of your friends do you think have used

marijuana, even once or twice in the past twelve months?” Additionally, participants were asked in free response format to list ways in which the people in their social network were similar and different to one another.

It needs to be noted that this is not a typical measure of attitudinal congruence. Attitudinal congruence is most often measured with two items measuring certainty and ambivalence. Visser and Mirabile (2004), for example, asked participants how certain they were that their views were correct, and how conflicted they felt about a particular issue.

These items were not included in the initial questionnaire, and thus a descriptive norm item was used in their place to measure attitudinal congruence. One could make the argument that this measure is conceptually different in that the Visser and Mirabile (2004) items ask about the individual’s views on a particular issue, while descriptive norms ask about how others in one’s social network feel about a particular issue.

However, Visser and Mirabile (2004) note the importance of normative influence in shaping attitudinal congruence. In addition to providing information about the state of reality, reference groups also provide information about what attitudes, beliefs, and behaviors are deemed appropriate or desirable (e.g., Deutsch & Gerard, 1955; Kelley, 1952). People surrounded by significant others who share a particular attitude may be socially rewarded for expressing views that reinforce the majority opinion, and they may be socially punished for expressing divergent views (e.g., Schachter, 1951). Attitudinally congruous social networks, then, may cement an individual's attitudes by raising the interpersonal costs of attitude change. Given the high importance of normative influence

in informing attitudinal congruence, the descriptive norm item was used as a replacement for the more typically used attitudinal congruence items.

Chapter Four: Results

Main Effects

Before testing for potential mediation between environmental, behavioral and cognitive features, it is necessary to establish main effects for sensation seeking and marijuana use on attitudes about marijuana and intention to use, as well as relevant interpersonal conversation, attitudinal congruence, and media use variables.

Sensation seeking and use were moderately correlated $r(114) = .27, p < .05$. Given that the correlation is only moderate however, sensation seeking and use were used as separate predictors in the study. Though the potential for multicollinearity exists in using the two as separate predictors, the correlation was low enough that we may be missing valuable information by combining them into a single predictor. As discussed shortly, differences were observed in media use patterns between sensation seeking and past use, as well as in some mediation models using use and sensation seeking as separate predictors, while mediator and outcome variables remained the same. Therefore, in the sense that some high sensation seekers may not be users and vice versa, using them as separate predictors may have important implications for health educators designing messages aimed at a target group.

To establish main effects for sensation seeking on attitudes and intentions, sensation seeking was made into a dichotomous variable via a median split, and a t-test was performed. In comparison to low sensation seekers ($M = 3.00, SD = 1.37$), high sensation seekers ($M = 3.83, SD = 1.45$) had more positive attitudes toward marijuana,

$t(114)=-3.16, p<.05$. High sensation seekers ($M=3.03, SD=2.19$) also had stronger intentions to use marijuana than low sensation seekers ($M=1.94, SD=1.62$), $t(114)=-3.01, p<.01$.

A t-test was also performed on past usage status and attitudes and intentions about marijuana. Participants were asked whether they had ever, once, used marijuana. In comparison to non-users ($M=2.50, SD=1.07$), users ($M=4.49, SD=1.10$) had more positive attitudes toward marijuana, $t(114)=9.81, p<.01$. Users ($M=3.77, SD=2.12$) also had stronger intentions to use marijuana than non-users ($M=1.40, SD=1.01$), $t(114)=7.85, p<.01$.

A chi-squared test of independence was performed to examine the relation between sensation seeking and usage status and communicating about marijuana content in the media. The relationship between sensation seeking and communicating about marijuana content in the media was not significant, $\chi^2(1, N=91)=.03, ns$.

Usage status and communicating about marijuana content in the media was also not significant, $\chi^2(1, N=91)=1.25, ns$.

T-tests were conducted to examine a main effect of sensation seeking and use on valence of conversations about marijuana. Participants were asked whether conversations about marijuana with friends were more positive or negative. High sensation seekers ($M=3.59, SD=.88$) were more likely to have positive conversations about marijuana than were low sensation seekers ($M=3.03, SD=1.04$), $t(75)=-2.50, p<.01$. Additionally, users ($M=3.70, SD=.94$) were more likely to have positive conversations about marijuana than non-users ($M=2.87, SD=.85$), $t(75)=3.98, p<.01$. However, no differences were found in

expression of negative thoughts about antimarijuana content in the media between high (M=1.79, SD=.41) and low sensation seekers (M=1.80, SD=.40), $t(89)=-.16$, ns or between users (M=1.76, SD=.43) and non-users (M=1.85, SD=.36), $t(89)=-1.11$, ns.

To test for a main effect of sensation seeking and use on attitudinal congruence, a descriptive norm item was used as a measure of attitudinal congruence. Participants were asked how many of their friends they thought have used marijuana, even once or twice in the past twelve months. High sensation seekers (M=2.98, SD=.85) were found to have higher levels of attitudinal congruence for issues of marijuana use than low sensation seekers (M=2.59, SD=.76), $t(114)=-2.61$, $p<.01$. Additionally, users (M=3.17, SD=.80) were found to have higher levels of attitudinal congruence than non-users (M=2.47, SD=.72), $t(114)=4.97$, $p<.01$.

To assess media use, the number of participants who reported at least infrequent use of that media was divided by the total number of participants in the study to get a percentage of the sample who engages each media vehicle.

Results indicate noteworthy differences in the percentage of the overall sample that use specific media. Among general media use, a large percentage of participants reported watching rented or purchased movies at home (97%), reading magazines (85%), and going to movies in a movie theater (82%). For internet use, participants reported high use of websites related to social networking (e.g., facebook, myspace) (93%), music (83%), and news (64%). For television use, participants reported high use in movies on tv (91%), sitcoms (72%) and reality television (66%). For general media use, brochures (34%) and video/computer games (42%) were used the least among our sample. For

internet use, participants reported the lowest use in blogs (22%) and health information (30%). For television use, participants reported the lowest use in health (22%) and political (22%) programming.

Table 1 goes about here

Some differences existed between high and low sensation seekers in their media use. High sensation seekers ($M=4.31$, $SD=1.52$) reported watching movies on video and DVD more frequently than low sensation seekers ($M=3.74$, $SD=1.53$), $t(110)=-1.97$, $p<.05$. Similarly, high sensation seekers ($M=4.38$, $SD=1.95$) reported using video and computer games more frequently than low sensation seekers ($M=3.35$, $SD=1.50$), $t(47)=-2.08$, $p<.05$. For all other media vehicles, no differences existed in frequency of media use.

Table 2 goes about here

Research question two examined whether high and low sensation seekers differed in self-reports on exposure and valence of marijuana content in the media. For exposure, a significant difference was observed for reported exposure to marijuana content in television political programming between high ($M=2.63$, $SD=.83$) and low sensation seekers ($M=1.89$, $SD=.60$), $t(26)=-2.39$, $p<.05$. While no other vehicles were significant

at the .05 level, a number of vehicles trended towards significance for reported exposure, with p values below .10. High sensation seekers reported more exposure to marijuana content in video/computer games, blogs, music television, and movies on television.

Table 3 goes about here

In reports of valence of marijuana content in the media, high sensation seekers ($M=3.00$, $SD=1.03$) reported marijuana content in video/computer games to be significantly more positive than low sensation seekers ($M=2.10$, $SD=.88$), $t(28)=-2.37$, $p<.05$. Results also trended towards significance in the same direction for brochures and pamphlets, and blogs.

Table 4 goes about here

Differences were also observed between users and non-users in media use. Users ($M=5.19$, $SD=1.18$) reported browsing websites related to pop culture significantly more than non users ($M=4.45$, $SD=1.37$), $t(58)=2.19$, $p<.05$. Users also reported higher magazine use ($M=3.56$, $SD=1.57$) than non-users ($M=2.73$, $SD=1.02$), $t(96)=3.23$, $p<.05$. Additionally, results trended toward significance for political television programming.

Table 5 goes about here

Users and non-users also reported significant differences for exposure to marijuana content in the media. In comparison to non-users, users reported increased frequency in marijuana content for magazines--users (M=2.21, SD=.94) non-users (M=1.84, SD=.78), $t(96)=2.19$, $p<.05$; reality tv-- users (M=2.57, SD=.88), non- users (M=2.17, SD=.88), $t(75)=2.04$, $p<.05$; and political television programming--users (M=2.77, SD=.83) non-users (M=2.07, SD=.70), $t(26)=2.42$, $p<.05$.

Table 6 goes about here

In reports of valence of marijuana content in the media, users (M=3.18, SD=1.16) reported marijuana content in video/computer games to be significantly more positive than non-users (M=2.42, SD=.90). Results also trended toward significance in the same direction for movies on television, and documentaries, and in the opposite direction for health-related content.

Table 7 goes about here

Mediation

Having established main effects for sensation seeking and use on positive conversation about marijuana, attitudinal congruence, media use, and attitudes and intentions, mediation analysis was conducted to test for possible relationships among these variables. That is, given the significant relationships among these variables, the next step is to determine how these variables may mediate each other to influence attitudes and intentions, in line with social learning theory.

To test for partial mediation, the bootstrapping method outlined in Preacher and Hayes (2004) was used. This is a method that extends the work of Baron and Kenny's (1986) method of testing for full mediation. To test for mediation using the Baron and Kenny (1986) method, one should estimate the three following regression equations: first, regressing the mediator on the independent variable; second, regressing the dependent variable on the independent variable; and third regressing the dependent variable on both the independent variable and on the mediator. Separate coefficients for each equation should be estimated. These three regression equations provide the tests of the linkages of the mediational model. To establish mediation, the following conditions must hold: First, the independent variable must affect the mediator in the first equation; second, the independent variable must be shown to affect the dependent variable in the second equation; and third, the mediator must affect the dependent variable in the third equation. If these conditions all hold in the predicted direction, then the effect of the independent variable on the dependent variable must be less in the third equation than in the second.

Perfect mediation holds if the independent variable has no effect when the mediator is controlled.

It is important to note that the statistical significance between the total effect and the direct effect of X on Y is not formally stated as a requirement for mediation under the Baron and Kenny (1986) method. However, Preacher & Hayes (2004) point out the distinct possibility of committing both Type I and Type II errors using the Baron & Kenny (1986) method if post-hoc significance testing is not conducted.

Bootstrapping is a method that allows researchers to test for statistically significant partial mediation. In other words, it allows researchers to examine whether statistically significant relationships between an independent, dependent, and mediator variable exist when full mediation is not achieved. Bootstrapping is typically used to test for partial mediation when sample sizes are not large. When sample sizes are large, the Sobel test provides a more direct test of an indirect effect (Sobel, 1982). In the case of simple mediation, the Sobel test is conducted by comparing the strength of the indirect effect of X on Y to the point null hypothesis that it equals zero. The Sobel test assumes normal distribution. Preacher and Hayes (2004) point out that particularly in small sample sizes, the assumption of normality is often not met, and many times not even symmetrical. Because the distribution of products is positively skewed, the symmetric confidence interval based on the assumption of normality will typically yield underpowered tests of mediation.

Preacher & Hayes (2004) suggest that for small sample sizes, an alternative approach is to bootstrap the sampling distribution and derive a confidence interval with

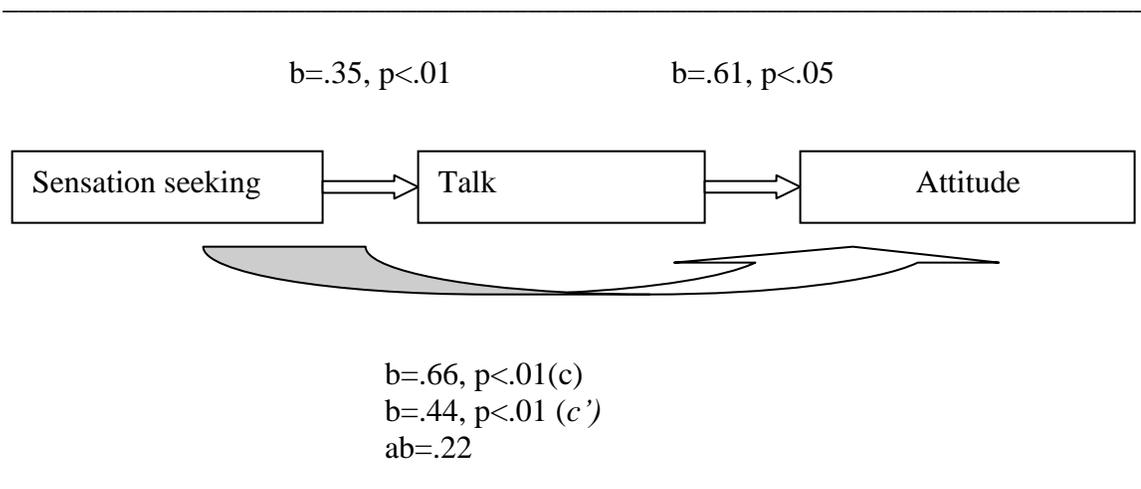
Bootstrapping is accomplished by taking a sample of size n from the original sample, sampling with replacement, and computing the indirect effect, ab , in each sample. Figure 2B depicts a simple mediation model and shows how variable X 's causal effect can be apportioned into its *indirect effect* on Y through M and its *direct effect* on Y (path c'). Path a represents the effect of X on the proposed mediator, whereas path b is the effect of M on Y partialling out the effect of X . All of these paths would typically be quantified with unstandardized regression coefficients. The indirect effect of X on Y through M can then be quantified as the product of a and b (i.e., ab). The total effect of X on Y is quantified with the unstandardized regression weight c (Figure 1A). The *total effect* of X on Y can be expressed as the sum of the direct and indirect effects: $c = c' + ab$. Equivalently, c' is the difference between the total effect of X on Y and the indirect effect of X on Y through M —that is, $c' = c - ab$. In other words, if there exists a significant partial mediation relationship, the total effect of X on Y is significantly different from the indirect effect of X on Y through M , or $c - ab$.

Assume for the sake of illustration that 5,000 bootstrap samples have been requested. The point estimate of ab is simply the mean ab computed over the 5,000 samples, and the estimated standard error is the standard deviation of the 5,000 ab estimates. To derive the 95% confidence interval, the elements of the vector of 5,000 estimates of ab are sorted from low to high. The lower limit of the confidence interval is defined as the 25th score in this sorted distribution, and the upper limit is defined as the 976th score in the distribution. Using the same logic, the upper and lower bounds of a 99% confidence interval correspond to the 5th and 996th scores in the sorted distribution

of 5,000 estimates, respectively. Preacher & Hayes (2004) suggest that when zero is not in the 95% confidence interval, we can conclude that the indirect effect is indeed significantly different than zero at $p < .05$ (two tailed).

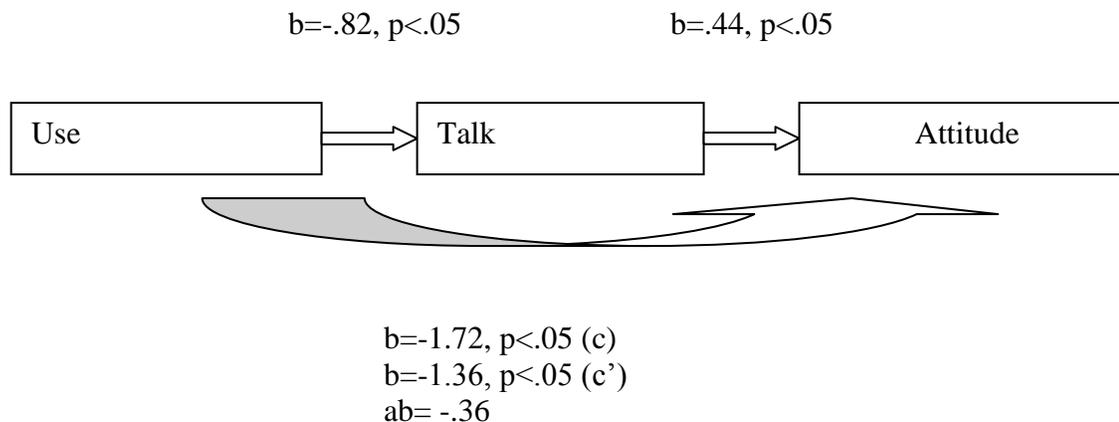
Figures 3 through 12 presents the results of the bootstrapping mediation analysis done on the hypothesized relationships discussed previously.

Figure 3. *Effects of mediation of sensation seeking → talk → attitude.*



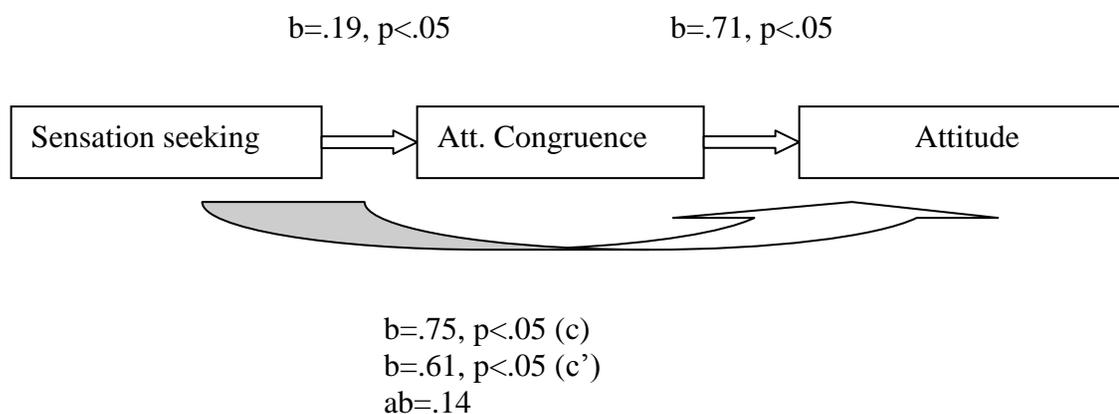
The effect of sensation seeking on attitudes about marijuana was found to be mediated by positive talk about marijuana. Here, the direct effect of sensation seeking on attitude is .66, while the indirect effect ($c-ab$), taking talk into account, is .44. Bootstrapping analysis (with 5,000 iterations) found that the indirect effect was significantly different than zero ($p < .05$, 95% confidence interval = .02, .46). People high in sensation seeking talk positively about marijuana, and these conversations inform attitudes about marijuana.

Figure 4. *Effects of mediation of use → talk → attitude.*



The effect of use on attitudes about marijuana was found to be mediated by positive talk about marijuana. Here, the direct effect of use on attitude is -1.72, while the indirect effect ($c-ab$), taking talk into account, is -1.36. Bootstrapping analysis (with 5,000 iterations) found that the indirect effect was significantly different than zero ($p < .05$, 95% confidence interval = -.69, -.12). Marijuana users talk positively about marijuana, and these conversations inform attitudes about marijuana.

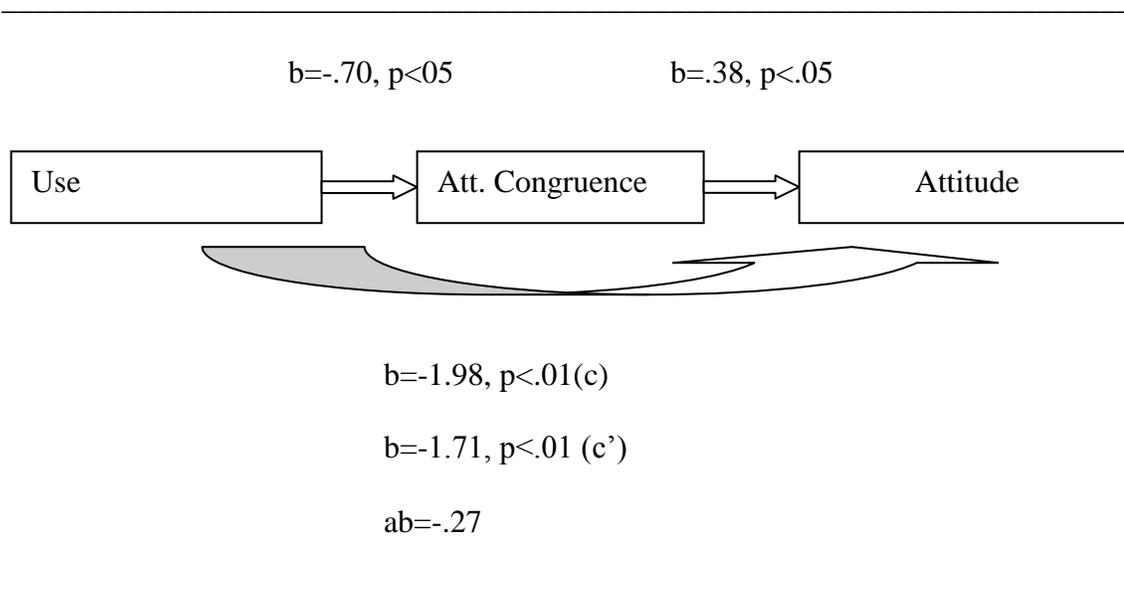
Figure 5. *Effects of mediation of sensation seeking → attitudinal congruence → attitude.*



The effect of sensation seeking on attitudes about marijuana was found to be mediated by attitudinal congruence. Here, the direct effect of sensation seeking on attitude is .75, while the indirect effect ($c-ab$), taking attitudinal congruence into account,

is .61. Bootstrapping analysis (with 5,000 iterations) found that the indirect effect was not significantly different than zero ($p < .05$, 95% confidence interval = .01, .28). These results suggest that attitudinal congruence in the social networks of high sensation seekers do not inform attitudes about marijuana.

Figure 6. *Effects of mediation of use → attitudinal congruence → attitude.*

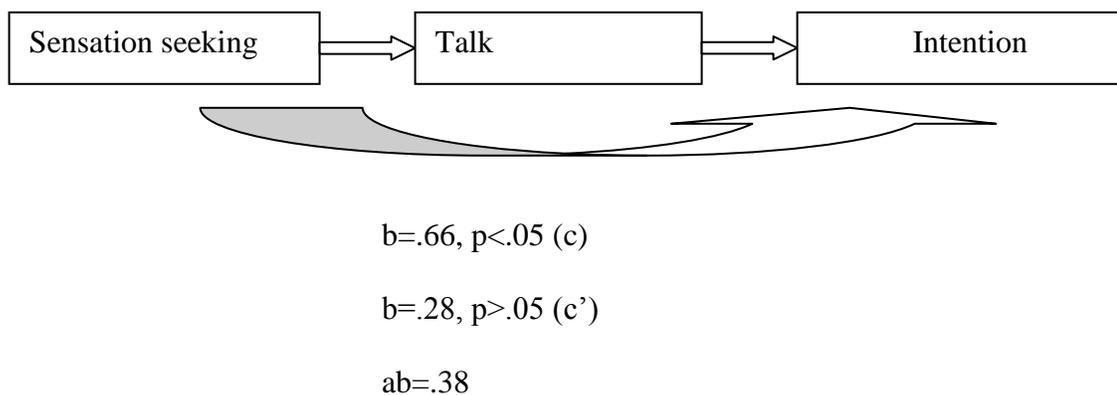


The effect of use on attitudes about marijuana was found to be mediated by attitudinal congruence. Here, the direct effect of use on attitudes is $-.1.98$, while the indirect effect ($c-ab$), taking attitudinal congruence into account, is -1.71 . Bootstrapping analysis (with 5,000 iterations) found that the indirect effect was significantly different than zero ($p < .05$, 95% confidence interval = $-.52, -.08$). Marijuana users exist in attitudinally congruent social networks, and that attitudinal congruence informs attitudes about marijuana.

Figure 7. *Effects of mediation of sensation seeking → talk → intention.*

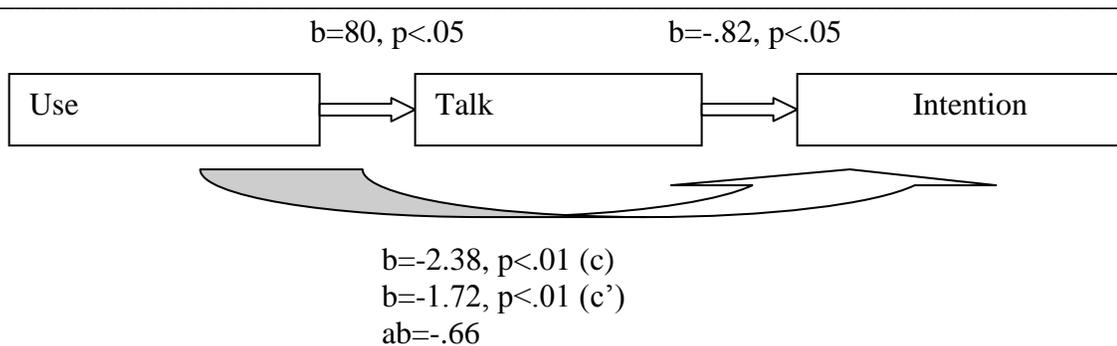
$b = .35, p < .05$

$b = 1.09, p < .01$



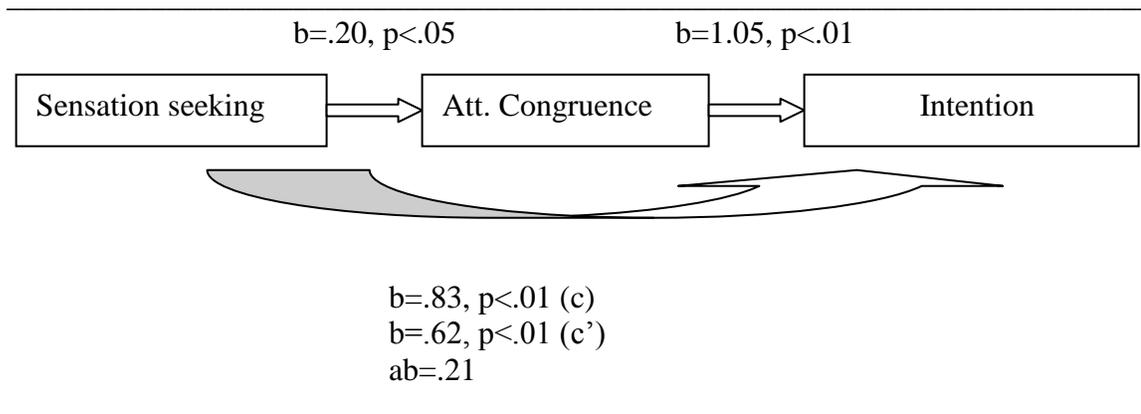
The effect of sensation seeking on intention to use marijuana was found to be mediated by positive talk about marijuana. Here, the direct effect of sensation seeking on intention is .66, while the indirect effect ($c-ab$), taking talk into account, is .28. Bootstrapping analysis (with 5,000 iterations) found that the indirect effect was significantly different than zero ($p < .05$, 95% confidence interval = .038, .78). Sensation seekers talk positively about marijuana, and that positive talk informs intention to use marijuana.

Figure 8. *Effects of mediation of use → talk → intention.*



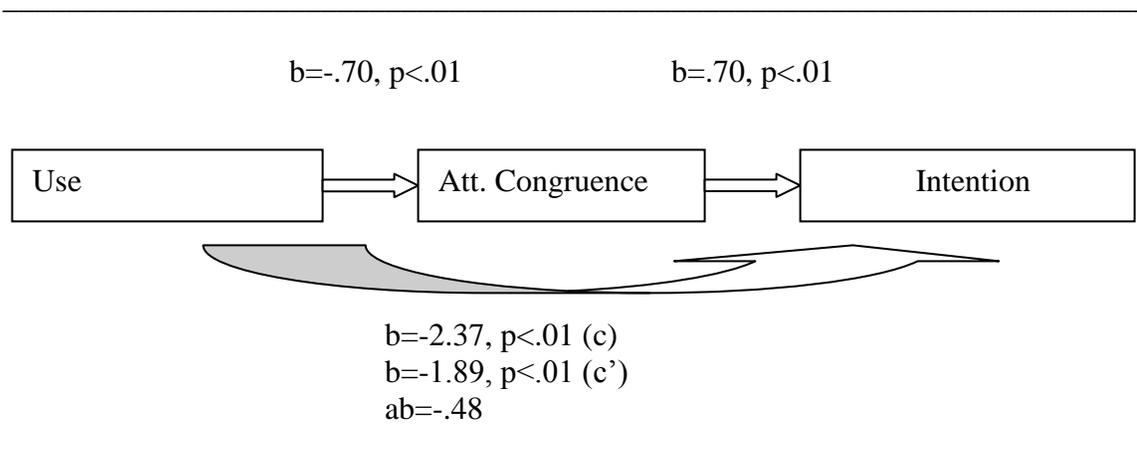
The effect of use on intention to use marijuana was found to be mediated by positive talk about marijuana. Here, the direct effect of use on intention is -2.38, while the indirect effect ($c-ab$), taking talk into account, is -1.72. Bootstrapping analysis (with 5,000 iterations) found that the indirect effect was significantly different than zero ($p < .05$, 95% confidence interval = -1.19, -.25). Marijuana users talk positively about marijuana, and that positive talk informs intention to use marijuana.

Figure 9. *Effects of mediation of sensation seeking → attitudinal congruence → intention.*



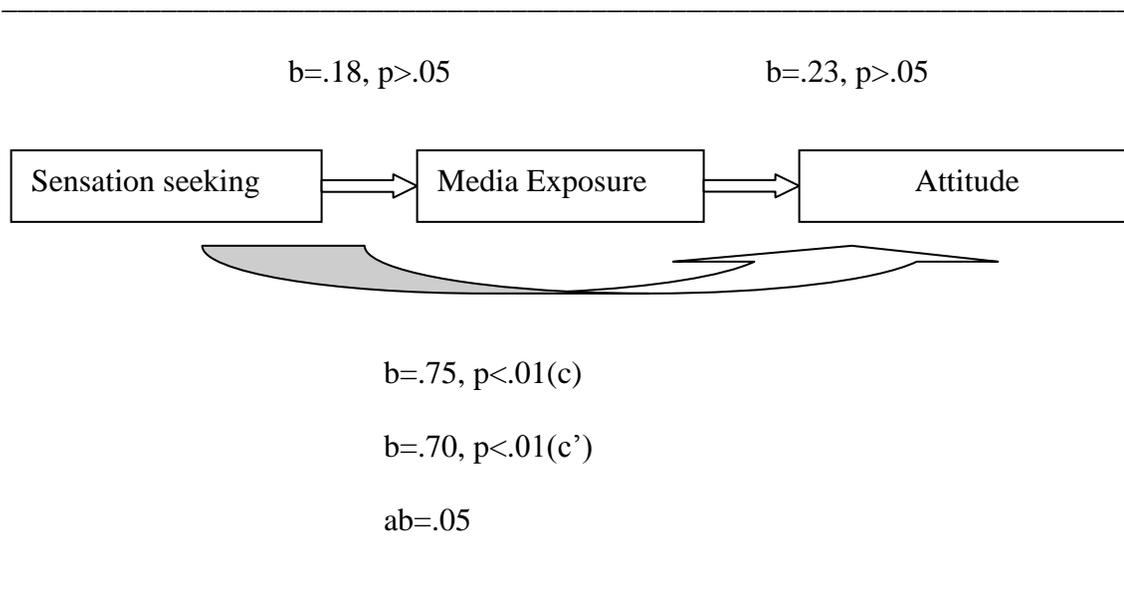
The effect of sensation seeking on intention to use marijuana was found to be mediated by attitudinal congruence. Here, the direct effect of sensation seeking on intention is .83, while the indirect effect ($c-ab$), taking attitudinal congruence into account, is .62. Bootstrapping analysis (with 5,000 iterations) found that the indirect effect was significantly different than zero ($p<.05$, 95% confidence interval = .01, .42). Sensation seekers exist in attitudinally congruent social networks, and that attitudinal congruence informs intention to use marijuana.

Figure 10. *Effects of mediation of use → attitudinal congruence → intention.*



The effect of use on intention to use marijuana was found to be mediated by attitudinal congruence. Here, the direct effect of use on intention is -2.37 , while the indirect effect ($c-ab$), taking attitudinal congruence into account, is -1.89 . Bootstrapping analysis (with 5,000 iterations) found that the indirect effect was significantly different than zero ($p < .05$, 95% confidence interval = $-.85, -.18$). Marijuana users exist in attitudinally congruent social networks, and that attitudinal congruence informs intention to use marijuana.

Figure 11. *Effects of mediation of sensation seeking \rightarrow media exposure \rightarrow attitude.*



The effect of sensation seeking on attitude was not found to be mediated by media exposure. Here, the direct effect of sensation seeking on attitudes is $.75$, while the indirect effect ($c-ab$), taking media exposure into account, is $.70$. Bootstrapping analysis (with 5,000 iterations) found that the indirect effect was not significantly different than zero ($p > .05$, 95% confidence interval = $-.01, .14$). Sensation seekers' exposure to marijuana content in the media does not inform their attitudes.

Figure 12. *Fixed effects of mediation of use \rightarrow media exposure \rightarrow attitude.*

$b = -.42, p < .01$

$b = -.06, p < .01$



$b=-1.93, p<.01(c)$

$b=-1.96, p<.01(c')$

$ab=.03$

The effect of use on attitude was not found to be mediated by media exposure. Here, the direct effect of use on attitudes is -1.93, while the indirect effect ($c-ab$), taking media exposure into account, is -1.96. Bootstrapping analysis (with 5,000 iterations) found that the indirect effect was not significantly different than zero ($p>.05$, 95% confidence interval = -.10, .17). Marijuana users exposure to marijuana content in the media does not inform their attitudes.

Chapter Five: General Discussion

Over the years, research in mass communication has shown a continued interest in assessing teen marijuana use. Research on teen marijuana use has focused on the effects (and lack thereof) of communication campaigns, the role of individual difference variables such as sensation seeking, the impact of past use on intention, information diffusion through interpersonal communication, unintended effects of conversation about marijuana content, and the role social networks play in forming, and maintaining, attitudes about marijuana.

The present study represents an initial attempt to incorporate many of these lines of research into a single research agenda. In using social learning theory as a conceptual framework, the study suggests that cognitive, environmental, and behavioral factors may be complimentary in informing attitudes about marijuana and intention to use. The study aims to demonstrate that these factors should not be seen as mutually exclusive, but rather as potential mediators of each other that can be analyzed as part of a single research agenda.

Additionally, it attempts to look at these effects not as a function of responses to specific campaigns, but rather through the lens of teens' general media environment. In other words, it attempts to widen the scope of research in these areas by thinking about how these effects may work in the "real world" media atmosphere in which teens exist. Certainly, researching responses to specific campaigns has value. Demonstrating, for example, that teens may talk about campaign content in ways campaign organizers would

neither anticipate nor desire (David et al., 2006) is of great value to both the literature on interpersonal communication, and to the professionals responsible for organizing campaigns and targeting specific groups (such as sensation seekers), with campaign messages. For professionals, understanding that they need to think about not only how to reach an audience, but also how that audience is going to diffuse the content of the message is not insignificant.

However, campaign-specific research often fails to address a frequent concern within mass communication—that people do not exist in a media bubble in which we can expect any single message to be fully attended to, stored, and retrieved with great accuracy. Annie Lang's (2000) limited capacity model of mediated message processing suggests that a number of barriers exist at each stage of the process (encoding, storage, retrieval). Encoding difficulties may be a greater concern now than ever before as “new” media vehicles continue to emerge. One only needs to think of a teen with the television on in the background, surfing the internet on his laptop, and texting on his cell phone to realize the difficulties of reaching him or her with a campaign message that they will attend to. It is in this vein that the present research attempts to extend previous research on determinants of attitudes about marijuana by looking at how these concepts work at a broader media level. Replicating the results found at the campaign level would provide an important validation for that work; failing to find consistent results, on the other hand, would suggest that we may need to proceed with caution in assuming that the mechanisms through which teens process and discuss media content in a controlled lab setting is replicated in their actual interpersonal and media worlds.

Main Effects

The first stage of the study's analyses assessed main effects for a number of variables on attitudes and intentions. The goal of this part of the analysis was largely to attempt to replicate previous findings as a justification to test for mediator relationships. As expected a main effect was found for sensation seeking and past use on attitudes toward marijuana and intention to use. This finding replicates previous results and serves as a necessary stepping stone to testing more interesting relationships.

Main effects were also found for both sensation seeking and usage status on positive conversations about marijuana. This serves as a partial validation of the David et al. (2006) study, which found that high sensation seekers were more likely to talk positively about marijuana than low sensation seekers. Again, this result is not unexpected but does provide justification for testing positive conversation about marijuana as a potential mediator of attitudes and intention.

Interestingly though, no main effect was found for sensation seeking and usage status on negative conversations about antimarijuana content in the media. Note that in the David et al. (2006) study, high sensation seekers talked more negatively about antimarijuana content seen in campaign messages to peer groups. The implication in the David et al. (2006) study was that high sensation seekers, who are often the target of antimarijuana campaigns, may diffuse campaign content in deleterious ways. Here though, we do not see such an effect for antimarijuana content in teens' general media environment. This harps back to the idea that content consumed in a laboratory setting, such as that in the David et al. (2006) study, may not be a realistic portrayal of the way

teens' actually consume media content. Rather, in their cluttered media worlds, such content may exert significantly less influence, and thus deleterious effects (or any effects at all) of conversation about campaigns may not be as large a concern as the David et al. (2006) piece suggests.

Main effects were found for sensation seekers and users on attitudinal congruence in their social networks for the issue of marijuana use. The implication here is that high sensation seekers and past users do in fact exist in social networks where marijuana use is more prevalent, suggesting that attitudes about marijuana may be stronger, and less open to persuasion, as suggested in the Visser & Mirabile (2004) work. This serves as the basis to test this relationship through mediation analysis.

For media use, results suggested that high and low sensation seekers and users and non users reported some differences in media use. For movies on video and DVD and video/computer games significant differences were observed-with high sensation seekers using both significantly more than low sensation seekers. Users reported higher use of magazines and websites related to pop culture more than non-users. Given that over thirty media vehicles were tested, these results may be more a result of capitalization on chance than anything else. This is an idea that will be discussed in greater detail later.

The more interesting finding for media use is differences in exposure to marijuana content in the media. A number of media vehicles either reached significance or trended toward significance ($p < .10$) for both high sensation seekers and users in comparison to low sensation seekers and non-users.

This paints an interesting picture. High and low sensation seekers may seek out information selectively to match the level of personal relevance marijuana has for them. High sensation seekers may be engaging in a kind of selective memory, viewing the same media as low sensation seekers but placing greater weight in those messages in line with the relevancy of marijuana for them and possibly their usage status. Low sensation seekers may engage in similar processes for antimarijuana messages. Participants may be selectively attending to marijuana content in the media, preferring information that is consistent with previously held beliefs and avoiding information counter to those beliefs. Thus, marijuana content in the media may act in a feedback loop. Because exposure to positive or negative media health content has been shown to inform attitudes, high and low sensations seekers and users and non-users may have their attitudes about marijuana and intentions to use marijuana reaffirmed and strengthened through media exposure—even though the media they report is largely the same. A test of the potential mediating role of exposure, on the sensation seeking-attitude and use-attitude relationship is thus a relevant next step.

Mediation

Positive talk about marijuana was found to partially mediate the relationship between both sensation seeking and use and attitudes and intentions to use marijuana. Here, we see how cognitive factors (sensation seeking) and behavioral factors (usage status) act in a complimentary fashion with environmental factors (interpersonal communication) to inform attitudes and intention.

These results suggest that differences in sensation seeking and usage status affect how teens talk about marijuana. High sensation seekers and users talk about marijuana more positively than low sensation seekers and non-users. Importantly, the degree to which they talk positively about marijuana has an impact on how favorably they view marijuana, and how likely they will be to use in the future. While level of sensation seeking and usage status certainly matter in informing attitudes and intentions, their impacted can be increased or blunted by level of positive talk about marijuana.

On a scholarly level, this suggests the importance of considering interpersonal variables when looking at the impact of individual difference variables on attitudes and intentions. As discussed previously, a great deal of research suggests sensation seeking is a key variable in informing drug attitudes and intentions, and is often a focal point of campaign messages. However, ignoring valence of marijuana conversations may skew these results. If a high sensation seeker, for example, is exposed primarily to negative conversations about marijuana in his social networks, he is less likely to hold positive attitudes and intentions than a high sensation seeker who frequently talks positively about marijuana. In examining how likely a sensation seeker or past user is to use, then, researchers need to examine not just differences on level of sensation seeking, but also the interpersonal worlds in which they live.

These results also have important implications for campaigns. Campaigns targeting high sensation seekers are common, but many of these campaigns fail to consider the importance of interpersonal variables. Given that campaign funds are limited and important decisions need to be made in targeting a specific segment of a population

with a campaign message, using valence of marijuana conversations as a potential moderating variable could increase the likelihood of reaching a group most likely to be receptive to campaign messages and susceptible to attitude change. Depue et al., (2008) note the importance of using moderator variables as a segmentation dimension in health campaigns using behavior change theory to target groups with health campaign messages.

Attitudinal congruence was also found to partially mediate the relationship between sensation seeking and use and attitudes and intentions to use marijuana. High sensation seekers and users who existed in attitudinally congruent social networks were more likely to hold favorable attitudes about marijuana and have greater intention to use than were high sensation seekers and users in attitudinally heterogeneous social networks. As reported earlier, high sensation seekers and users were also more likely to exist in homogeneous social networks than low sensation seekers and non-users.

These results provide support for Visser and Mirabile's (2004) work on attitudinal congruence and suggest important implications for teen marijuana use. The results suggest that high sensation seekers and drug users are likely to exist in social networks with others like them, and that their already positive attitudes about marijuana are likely to become further reinforced within their homogenized social networks. Similar to the results on the role of talk in mediating attitudes and intentions, researchers need to consider the role social networks play in influencing the relationship between individual difference variables and attitudes and intentions to perform a given behavior.

Furthermore, from a campaign perspective, because those in homogenized social networks have increased attitudinal certainty, these groups should be less resistant to

persuasive appeals in the media that go against their preexisting beliefs. For example, the teen existing in a homogenized social network with pro-marijuana beliefs should quickly counter argue messages not in line with his or her views. Similar to assessing valence of marijuana conversations, campaign organizers targeting high sensation seekers and drug users would be wise to use the homogeneity of their social networks as a segmentation dimension in segmenting their population of interest.

Exposure to marijuana content, however, did not partially mediate the relationship between either sensation seeking or use and attitudes about marijuana. This suggests that, at least for the sample used, the amount of marijuana content in the media one is exposed to does not inform how favorably they view marijuana. Nevertheless, the use of descriptive media use items in the study does provide a nice example of how researchers and campaign organizers can move beyond measuring non-specific media use and towards a more nuanced assessment of how a given population uses media. This may be of particular import to health educators, who need to understand both how to craft a message that is tailored to the specific beliefs of a target group, and where to reach that group in the media (see Depue et al., (2008) for a review).

Finally, these results speak to one of the aims of this study, which is demonstrating one method through which various research tracks can be combined in a single study to gain a greater understanding of a particular issue. Social learning theory tells us that cognitive, environmental, and behavioral factors influence each other bi-directionally, rather than as separate constructs. In the present study, we see an example of how this process may occur for teen marijuana use.

Limitations and Conclusion

Because of the large number of hypotheses and research questions, the study suffers from the “capitalization on chance” idea. That is, because of the high number of relationships the study examined, it seemed highly likely that significant relationships would be found for some of them. Future research on these areas would be wide to narrow their scope in focusing more deeply on a few of these issues. Nevertheless, the research was exploratory in nature, and the large amount of hypotheses and research questions do not take away from the importance of the significant relationships that were found.

A second limitation is that the sample of college students in the Midwest limits any generalizability of the results. For example, while users and non-users were distributed equally in the sample, the vast majority of users reported low levels of use (once a month or less). Explanation of the results in terms of how behavioral experience informs our thoughts about the behavior thus would have been more compelling had the sample have contained a larger number of high frequency users.

This study is certainly not the first to attempt to combine cognitive, environmental and behavioral factors through mediation analysis. Nonetheless, given that much of the research on teen marijuana use focuses on just one of these factors, the results suggesting that these factors ought to be assessed as potentially complimentary to each other do have an important story to tell, both in their contribution to the academic literature and in their implications for health message design.

Table 1. Types of media used sample (percentage of total).

<i>General Media</i>	
Movies(dvd,video)	97%
Music not on radio	90%
Magazines	85%
Newspapers	85%
Movies(theater)	82%
Radio	68%
Posters	61%
Video/computer games	42%
Brochures	34%
<i>Internet</i>	
Social Networking	93%
Academics	84%
Music	83%
News	64%
Pop culture	52%
Sports	47%
Health Information	30%
Blogs	22%
<i>Television</i>	
Movies	91%
News	81%
Music	72%
Sitcoms	72%
“Reality” tv	66%
Pop culture	60%
Dramas	60%
Sports	57%
Talk shows	49%
Documentaries	44%
TV ads	41%
Health	24%
Politics	24%

Table 2. Mean differences in media use among low and high sensation seekers (significant differences in **bold**).

	LSS	HSS
<i>General Media</i>		
Movies(dvd,video)	3.74	4.31
Video/computer games	3.62	4.21
Magazines	2.88	3.30
Newspapers	4.33	4.68
Radio	4.17	4.60
Music not on radio	5.94	6.15
Movies(theater)	2.51	2.92
Posters	3.88	4.28
Brochures	3.00	3.59
<i>Internet</i>		
Sports	4.61	5.00
Music	4.80	4.75
News	4.47	4.62
Pop culture	4.67	4.90
Academics	5.32	5.71
Social Networking	6.38	6.47
Health Information	4.46	4.45
Blogs	4.29	5.09
<i>Television</i>		
Sports	5.32	5.58
Music	4.76	4.74
News	4.41	4.40
Pop culture	4.79	4.61
“Reality” tv	5.02	5.03
Movies	4.70	5.09
Health	3.87	4.47
Politics	3.78	4.47
Sitcoms	4.82	5.23
Dramas	5.00	5.17
Documentaries	4.04	4.18
TV ads	5.04	4.80
Talk shows	4.86	4.54

Table 3. Mean differences in exposure to marijuana content among low and high sensation seekers (significant differences in **bold**; results that trended toward significance ($p < .10$) in *italics*).

	LSS	HSS
<i>General Media</i>		
<i>Video/computer games</i>	<i>1.48</i>	<i>1.86</i>
Magazines	1.92	2.08
Newspapers	2.44	2.38
Radio	2.36	2.49
Music not on radio	2.80	3.19
Movies(theater)	2.73	2.86
Movies(dvd,video)	2.96	3.16
Posters	2.78	2.56
Brochures	2.53	2.14
<i>Internet</i>		
Sports	1.78	1.73
Music	2.39	2.71
News	2.73	2.82
Pop culture	3.10	3.13
Academics	1.47	1.63
Social Networking	2.78	2.77
Health Information	2.85	2.90
<i>Blogs</i>	<i>2.71</i>	<i>1.90</i>
<i>Television</i>		
Politics	1.89	2.63
<i>Movies</i>	<i>2.76</i>	<i>3.11</i>
<i>Music</i>	<i>2.66</i>	<i>3.02</i>
Sports	1.61	1.84
News	2.58	2.77
Pop culture	2.89	2.91
“Reality” tv	2.24	2.47
Health	2.60	2.62
Sitcoms	2.30	2.37
Dramas	2.48	2.36
Documentaries	1.78	2.18
TV ads	2.52	2.56
Talk shows	2.69	2.25

Table 4. Mean differences in valence of marijuana content among low and high sensation seekers (significant differences in **bold**; results that trended toward significance ($p < .10$) in *italics*).

	LSS	HSS
<i>General Media</i>		
Video/computer games	2.10	3.00
<i>Brochures</i>	<i>1.50</i>	<i>1.88</i>
Magazines	1.82	2.00
Newspapers	1.78	1.84
Radio	2.76	2.74
Music not on radio	3.67	3.88
Movies(theater)	3.24	3.27
Movies(dvd,video)	3.42	3.33
Posters	2.39	2.61
<i>Internet</i>		
<i>Blogs</i>	<i>3.56</i>	<i>2.67</i>
Sports	1.35	1.59
Music	3.29	3.59
News	1.90	1.94
Pop culture	2.92	3.08
Academics	1.47	1.60
Social Networking	3.71	3.48
Health Information	1.80	1.85
<i>Television</i>		
Sports	1.33	1.45
Music	3.48	3.53
News	1.95	2.02
Pop culture	3.00	3.13
“Reality” tv	3.00	2.91
Movies	3.23	3.23
Health	2.00	2.33
Politics	1.86	2.14
Sitcoms	2.91	3.00
Dramas	2.83	2.70
Documentaries	2.07	2.35
TV ads	1.44	1.60
Talk shows	1.92	2.22

Table 5. Mean differences in media use among users and non-users (significant differences in **bold**; results that trended toward significance ($p < .10$) in *italics*).

	Users	Non-users
<i>General Media</i>		
Magazines	3.56	2.73
Newspapers	4.78	4.34
Radio	4.35	4.44
Music not on radio	5.86	6.23
Movies(theater)	2.75	2.71
Movies(dvd,video)	3.88	4.17
Video/computer games	4.27	3.70
Posters	4.19	4.00
Brochures	3.28	3.38
<i>Internet</i>		
Pop culture	5.19	4.45
Sports	4.26	5.26
Music	4.65	4.88
News	4.31	4.73
Academics	5.77	5.34
Social Networking	6.41	6.44
Health Information	4.39	4.53
Blogs	5.12	4.41
<i>Television</i>		
<i>Politics</i>	<i>4.77</i>	<i>3.80</i>
Sports	5.00	5.86
Music	4.59	4.90
News	4.23	4.55
Pop culture	4.58	4.82
“Reality” tv	5.06	5.00
Movies	4.88	4.93
Health	4.54	3.73
Sitcoms	4.74	5.29
Dramas	5.14	5.05
Documentaries	4.08	4.15
TV ads	4.82	5.00
Talk shows	4.67	4.73

Table 6. Mean differences in exposure to marijuana content among users and non-users (significant differences in **bold**; results that trended toward significance ($p < .10$) in *italics*).

	Users	Non-users
<i>General Media</i>		
Magazines	2.21	1.84
Newspapers	2.38	2.43
Radio	2.59	2.29
Music not on radio	3.18	2.83
Movies(theater)	2.90	2.73
Movies(dvd,video)	3.18	2.97
Video/computer games	1.77	1.63
Posters	2.56	2.77
Brochures	2.11	2.48
<i>Internet</i>		
Sports	1.70	1.80
Music	2.72	2.41
News	2.69	2.85
Pop culture	3.15	3.09
Academics	1.50	1.60
Social Networking	2.84	2.72
Health Information	2.67	3.12
Blogs	2.38	2.38
<i>Television</i>		
“Reality” tv	2.57	2.17
Politics	2.77	2.07
Sports	1.73	1.75
Music	2.95	2.74
News	2.76	2.60
Pop culture	3.00	2.79
Movies	3.08	2.82
Health	2.46	2.73
Sitcoms	2.26	2.40
Dramas	2.55	2.32
Documentaries	2.08	1.93
TV ads	2.55	2.54
Talk shows	2.33	2.58

Table 7. Mean differences in valence of marijuana content among users and non-users (significant differences in **bold**; results that trended toward significance ($p < .10$) in *italics*).

	Users	Non-users
<i>General Media</i>		
Video/computer games	3.87	3.71
Magazines	2.03	1.73
Newspapers	2.55	2.54
Radio	2.33	2.58
Music not on radio	2.03	1.83
Movies(theater)	1.91	1.75
Movies(dvd,video)	2.97	2.55
Posters	3.44	3.10
Brochures	3.54	3.23
<i>Internet</i>		
Sports	3.18	2.42
Music	2.68	2.36
News	1.69	1.75
Pop culture	1.57	1.44
Academics	3.65	3.28
Social Networking	1.88	1.95
Health Information	3.00	3.00
Blogs	1.61	1.50
<i>Television</i>		
<i>Documentaries</i>	<i>2.30</i>	<i>1.82</i>
<i>Movies</i>	<i>2.08</i>	<i>1.91</i>
Sports	3.63	3.54
Music	1.71	2.00
News	3.00	3.30
Pop culture	1.57	1.29
“Reality” tv	3.41	3.60
Health	3.16	2.96
Politics	3.03	2.87
Sitcoms	3.24	3.22
Dramas	1.91	2.42
TV ads	2.97	2.95
Talk shows	2.87	2.67

Bibliography

- Aarts, H., Verplanken, B., & van Kippenberg, A. (1997). Habit information use in travel mode choices. *Acta Psychologica*, 96, 1–14.
- Aarts, H., Verplanken, B., & Knippenberg, A. (1998). Predicting behaviour from actions in the past: Repeated decision making or a matter of habit?. *Journal of Applied Social Psychology*, 28, 1355–1374.
- Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology*, 78, 53–63.
- Abrams, D.B., & Wilson, G.T. (1983). Alcohol, sexual arousal, and self-control. *Journal of Personality and Social Psychology*, 45(1), 188-198.
- Afifi, W. A., Morgan, S. E., Stephenson, M. T., Morse, C., Harrison, T., Reichert, T., (2006). Examining the decision to talk with family about organ donation: Applying the Theory of Motivated Information Management. *Communication Monographs*, 73, 188-215.
- Bagozzi, R. P., & Kimmel, S. K. (1995). A comparison of leading theories for the prediction of goal directed behaviours. *British Journal of Social Psychology*, 34, 437–461.
- Bandura, A. (2001). Social cognitive theory of mass communication. *Media Psychology*, 3, 265-299.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191-215.
- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist*, 54, 462-479.
- Barnea Z, Teiehman M, Rahar G. (1992). Personality, cognitive and interpersonal factors in adolescent substance use: a longitudinal test of an integrativemodel. *Journal of Youth Adolescence*, 21, 187-201.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173–1182.
- Bollen, K. A., & Stine, R. (1990). Direct and indirect effects: Classical and bootstrap estimates of variability. *Sociological Methodology*, 20, 115-140.
- Bowman, D., & Narayandas, D. (2001). Managing Customer- Initiated Contacts with Manufactures: The Impact on Share of Category Requirements and Word-of-Mouth Behavior. *Journal of Marketing Research*, 38, 281-97.
- Brehm, J. W., & Cohen, A. R. (1962). *Explorations in cognitive dissonance*. New York: Wiley.
- Brickell, T.A., Chatzisarantis, N.L.D. & Pretty, G.M. (2006). Using Past Behavior and Spontaneous Implementation Intentions to Enhance the Utility of the Theory of Planned Behavior in Predicting Exercise. *British Journal of Health Psychology*, 11, 249-262.
- Burnkrant, R., & Unnava, R. (1989). Self-referencing: A strategy for increasing processing of message content. *Personality and Social Psychology Bulletin*, 15, 628–638.

- David, C., Capella, J., & Fishbein, M (2006). The Social Diffusion of Influence Among Adolescents: Group Interaction in a Chat Room Environment About Antidrug Advertisements. *Communication Theory*, 16, 118-140.
- Depue, J., Yzer, M.C., Mannino, C.A., & Rothman, A. (2008). What and where: a theory-based segmentation analysis of marijuana use. *Presented at the International Communication Association annual conference*. Montreal, CA. May 2008.
- Deutsch, M., & Gerard, H. B. (1955). A study of normative and informational social influence upon individual judgment. *Journal of Abnormal and Social Psychology*, 51, 629-636.
- Donohew, L., Palmgreen, P., & Duncan, J. (1980). An activation model of information exposure. *Communication Monographs*, 47, 295-303.
- Donohew L. (1990). Public health campaigns: individual message strategies and a model. In: Ray EB, Donohew L, eds. *Communication and Health: Systems and Applications*. Hillsdale, NJ: Lawrence Erlbaum, 136–152.
- Donohew, L., Lorch, E., & Palmgreen, P. (1991). Sensation seeking and targeting of televised anti-drug PSAs. In L. Donohew, H. E. Sypher, & W. J. Bukoski (Eds.), *Persuasive communication and drug abuse prevention* (pp. 209–226). Hillsdale, NJ: Erlbaum.
- Donohew, L., Palmgreen, P., & Lorch, E. P. (1994). Attention, need for sensation, and health communication campaigns. *American Behavioral Scientist*, 38, 310–322.
- Donohew, L., Lorch, E. P., & Palmgreen, P. (1998). Applications of a theoretic model of information exposure to health interventions. *Human Communication Research*, 24, 454–468.
- Downing, J. W., Judd, C. M., & Brauer, M. (1992). Effects of repeated expressions on attitude extremity. *Journal of Personality and Social Psychology*, 63, 17–29.
- Eveland, W. P., Jr. (2004). The effect of political discussion in producing informed citizens: The roles of information, motivation, and elaboration. *Political Communication*, 21, 177-193.
- Eveland, W. P., Jr., Hayes, A. F., Shah, D. V., & Kwak, N. (2005). Understanding the relationship between communication and political knowledge: A model-comparison approach using panel data. *Political Communication*, 22, 423-446.
- Everett, M. W., & Palmgreen, P. (1995). Influences of sensation seeking, message sensation value, and program context on effectiveness of anticocaine public service announcements. *Health Communication*, 7, 225–248.
- Falomir, J. M., & Invernizzi, F. (1999). The role of social influence and smoker identity in resistance to smoking cessation. *Swiss Journal of Psychology*, 58, 73–84.
- Farquhar JW. Fortmann SR Flora JA. (1990). The Stanford Five-City Project: effects of community-wide education on cardiovascular disease risk. *JAMA*, 264, 359-365.
- Festinger, L., Schachter, S., & Bach, K. (1950). Social pressures on informal groups. New York: Harper and Row.
- Fishbein, M., Cappella, J. N., Hornik, R., Sayeed, S., Yzer, M., & Ahern, R. K. (2002). The role of theory in developing effective anti-drug public service announcements. In W. Crano & M. Burgoon (Eds.), *Mass media and drug*

- prevention: Classic and contemporary theories and research (pp. 89–118). Mahwah, NJ: Lawrence Erlbaum.
- Forsyth, G. & Hindeby, J.D. (1987). Personality and situation as determinants of desire to drink in young adults. *International Journal of the Addictions*, 22, 653-669.
- Hagger, M. & Chatzisarantis, N. (2007). *Intrinsic Motivation and Self-Determination in Exercise and Sport*. New York: Free Press.
- Hilgard, E.R. & Bower G.H. (1975). *Theories of Learning*. Englewood Cliffs, NY: Prentice Hall.
- Holbert, R.L. & Stephenson, M.T. (2002). The role of communication in the formation of an issue-based citizenry. *Communication Monographs*, 69, 296-310.
- Hornik, R. C. (1991). Alternative models of behavior change. In J. N. Wasserheit, S. O. Aral & K. K. Holmes (Eds.), *Research issues in human behavior and sexually transmitted diseases in the AIDS era* (pp. 201–217). Washington, D.C.: American Society for Microbiology.
- Hornik, R., Maklan, D., Judkins, D., Cadell, D., Yanovitzky, I., Zador, P. (2001). Evaluation of the national youth anti-drug media campaign: Second semi-annual report of findings. Rockville, MD: Westat.
- Hornik, R., & Yanovitzky, I. (2003). Using theory to design evaluations of communication campaigns: The case of the National Youth Anti-Drug Media Campaign. *Communication Theory*, 13, 204–224.
- Hovland, C. I., Campbell, E. H., & Brock, T. C. (1957). The effects of “commitment” on opinion change following communication. In C. I. Hovland (Ed.), *The order of presentation in persuasion* (pp. 23–32). New Haven, CT: Yale University Press.
- Hu, S.-C., & Lanese, R. R. (1998). The applicability of the theory of planned behaviour to the intention to quit smoking across workplaces in southern Taiwan. *Addictive Behaviours*, 23, 225–237.
- Hur, Y.M. & Bouchard, T.J. (1997). The genetic correlation between impulsivity and sensation seeking traits. *Behavior Genetics*, 27, 455-463.
- Hwang, Y. & Southwell, B.G. (2007). Can a personality trait predict talk about science? Sensation seeking as a science communication targeting variable. *Science Communication*, 29, 198-216.
- James, C., James, N., Davies, D., Harvey, P., and Tweddle, S. (1999). Preferences for different sources of information about cancer. *Patient Education and Counseling*, 37, 273-282.
- Johnson, J.D. (1997). *Cancer-related information seeking*. Cresskill, NJ: Hampton Press, Inc.
- Johnston L.D., Bachman J.G., O'Malley P.M., Schulenberg J. (2003). *Monitoring the Future: A Continuing Study of American Youth (8th, 10th, and 12th Grade Surveys)*. Ann Arbor, Mich: Inter-University Consortium for Political and Social Research.
- Jones, E. F., Beniger, J. R., & Westoff, C. F. (1980). Pill and IUD discontinuation in the United States, 1970–1975: The influence of the media. *Family Planning Perspectives*, 12(6), 293–300.
- Katz, E., & Lazarsfeld, P. (1955). *Personal influence*. New York: Free Press.

- Keller, E., & Berry, J. (2003). *The Influentials: One American in Ten Tells the Other Nine How to Vote, Where to Eat, and What to Buy*, New York: Free Press.
- Kelley, H. H. (1952). The two functions of reference groups. In G. E. Swanson, T. M. Newcomb, & E. L. Hartley (Eds.), *Readings in social psychology* (2nd ed.). New York: Holt.
- Kelly, J. A., St. Lawrence, J. S., Stevenson, L.Y., Hauth, A.C., Kalichman, S.C., Diaz, Y.E., (1992). Community AIDS/HIV risk reduction: The effects of endorsements by popular people in three cities. *American Journal of Public Health*, 82, 1483-1489.
- Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication*, 50, 46-70.
- Lee, N.K. and Oei, T.P.S., (1993). The importance of alcohol expectancies and drinking refusal self-efficacy in the quantity and frequency of alcohol consumption. *Journal of Substance Abuse*, 5, pp. 379–390.
- Liu, Y. (2006). Word of Mouth for Movies: Its Dynamics and Impact on Box Office Revenue. *Journal of Marketing*, 70, 74-89.
- Maisto, S. A., Conigliaro, J., McNeil, M., Kraemer, K., O'Connor, M., & Kelley, M. E. (1999). Factor structure of the SOCRATES in a sample of primary care patients. *Addictive Behaviors*, 24(6), 879–892.
- Martin, C. A., Kelly, T. H., Rayens, M. K., Brogli, B., Himelreich, K., Brenzel, Al., (2004). Sensation seeking and symptoms of disruptive disorder: Association with nicotine, alcohol, and marijuana use in early and mid-adolescence. *Psychological Reports*, 94, 1075–1082.
- Meissner, H. I., Potosky, A.L., and Convissor, R. (1992). How sources of health information relate to knowledge and use of cancer screening exams. *Journal of Community Health*, 17, 153-65.
- Moan, I. S., & Rise, J. (2005). Quitting smoking: Applying an extended version of the theory of planned behaviour in predicting intention and behaviour. *Journal of Applied Biobehavioral Research*, 10, 39–68.
- Murray J.P., Stam A. & Lastovicka J.L. (1993). Evaluating an anti-drinking and driving advertising campaign with a sample survey and time series intervention analysis. *Am Stat Assoc*, 88, 50-56.
- National Clearinghouse for Alcohol and Drug Information, “Tips for Teens: Marijuana. <http://ncadi.samhsa.gov/govpubs/phd641>. Accessed August 15, 2007.
- Netter, P., & Rammsayer, T. H. (1991). Reactivity to dopaminergic drugs and aggression related to personality traits. *Personality and Individual Differences*, 12, 1009-1017.
- Newcomb, M. D., & Felix-Ortiz, M. (1992). Multiple protective and risk factors for drug use and abuse: Cross sectional and prospective findings. *Journal of Personality and Social Psychology*, 63, 280–296.
- Norman, P., Conner, M. & Bell, R.(2000). The Theory of Planned Behavior and Exercise: Evidence for the Moderating Role of Past Behavior. *British Journal of Health Psychology*, 5, 249-261.
- Palmgreen, P., Donohew, L., Lorch, E. P., Hoyle, R. H., & Stephenson, M. T. (2001).

- Television campaigns and adolescent marijuana use: Tests of a sensation seeking targeting. *American Journal of Public Health*, 91, 292–296.
- Palmgreen, P., Stephenson, M. T., Everett, M. W., Basehart, J. R., & Francies, R. (2002). Perceived message sensation value (PMSV) and the dimensions and validation of a PMSV scale. *Health Communication*, 14, 403–428.
- Parent, E.C. & Newman, D.L. (1999). The role of sensation-seeking in alcohol use and risk-taking behavior among college women. *Journal of Alcohol and Drug Education*, 44(2), 12-28.
- Partnership for a Drug-Free America. (2000). Partnership attitude tracking study, spring 2000: Teens in grades 7 through 12. New York: Author.
- Petty, R. E., & Cacioppo, J. (1979). Issue-involvement can increase or decrease persuasion by enhancing message-relevant cognitive responses. *Journal of Personality and Social Psychology*, 37, 1915–1926.
- Petty, R. E., & Cacioppo, J. (1986). The Elaboration Likelihood Model of persuasion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 19, pp. 123–205). New York: Academic Press.
- Pierce, J. P., & Gilpin, E. A. (2001). News media coverage of smoking and health is associated with changes in population rates of smoking cessation but not initiation. *Tobacco Control*, 10(2), 145–153.
- Powell, M., Dunwoody, S., Griffin, R., & Neuwirth, K. (2007). Exploring lay uncertainty about an environmental health risk. *Public Understanding of Science*, 16, 323-343.
- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers*, 36, 717-731.
- Rammsayer, T. H. (2004). Extraversion and the dopamine hypothesis. In R. M. Stelmack (Ed.), *On the psychobiology of personality: Essays in honor of Marvin Zuckerman* (pp. 409-427). Ottawa, Canada: Elsevier.
- Rhodes, R.E., Jones, L.W. & Courneya, K.S. (2002). Extending the Theory of Planned Behavior in the Exercise Domain: A Comparison of Social Support and Subjective Norm. *Research Quarterly for Exercise and Sport*, 73 (2),193-1999.
- Roberti, J. W. (2004). A review of behavioral and biological correlates of sensation seeking. *Journal of Research in Personality*, 38, 256–279.
- Rogers, E. (1962). *Diffusion of innovations*. New York: Free Press.
- Schachter, S. (1951). Deviation, rejection, and communication. *Journal of Abnormal and Social Psychology*, 46, 190–207.
- Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, 7, 422-445.
- Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equations models. In S. Leinhardt (Ed.), *Sociological methodology* (pp. 290-312). San Francisco: Jossey-Bass.
- Southwell, B. G., & Yzer, M. C. (2007). The roles of interpersonal communication in mass media campaigns. *Communication Yearbook*, 31, 420-462.

- Stamm, K. R., Clark, F., & Eblacas, P. R. (2000). Mass communication and public understanding of environmental problems: The case of global warming. *Public Understanding of Science, 9*, 219-237.
- Stephenson M.T. (1999). *Message Sensation Value and Sensation Seeking as Determinants of Message Processing* [dissertation]. Lexington: University of Kentucky.
- Stryker, J.E. (2003). Media and Marijuana: A longitudinal analysis of news media effects on adolescents' marijuana use and related outcomes, 1977-1999. *Journal of Health Communication, 8*, 305-328.
- Svenkerud, P. J., Singhal, A., & Papa, M. J. (1998). Diffusion of innovations theory and effective targeting of HIV/AIDS programmes in Thailand. *Asian Journal of Communication, 8*, 1-30.
- Symons Downs, D. & Hausenblas, H.A. (2003). Exercising for Two: Examining Pregnant Women's Second Trimester Exercise Intention and Behavior Using the Framework of the Theory of Planned Behavior. *Women's Health Issues, 13*, 222-228
- Visser, P. S., & Mirabile, R. R. (2004). Attitudes in the Social Context: The Impact of Social Network Composition on Individual-Level Attitude Strength. *Journal of Personality and Social Psychology, 87*, 779-795.
- Willemsen, M. C., de Vries, H., van Breukelen, G., & Oldenbrug, B. (1996). Determinants of intention to quit smoking among Dutch employees: The influence of the social environment. *Preventive Medicine, 25*, 195-202.
- Zuckerman, M., & Link, K. (1968). Construct validity for the sensation-seeking scale. *Journal of Consulting and Clinical Psychology, 32*, 420-426.
- Zuckerman, M. (1984). Sensation seeking: A comparative approach to a human trait. *Behavioral and Brain Sciences, 7*, 413-471.
- Zuckerman, M., & Kuhlman, S. (2000). Personality and risk-taking: Common biosocial factors. *Journal of Personality, 68*, 999-1029.