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THE ROLE OF EXPECTANCIES IN SMOKING BEHAVIOR IN MIDDLE SCHOOL AND HIGH SCHOOL: AN ADAPTATION AND EXTENSION OF THE THEORY OF PLANNED BEHAVIOR

by

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entitled The role of expectancies in smoking behavior in middle school and high school: An adaptation and extension of the theory of planned behavior

and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy

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Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copy of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

Dissertation Director Jennifer Maggs, Ph.D.	Date 6/3/02

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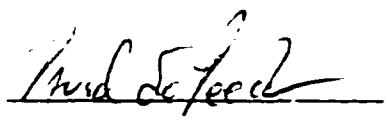
SIGNED: 

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ABSTRACT

This study focuses on the utility of the expectancy construct in the prediction of adolescent cigarette smoking within the theory of planned behavior. Hypotheses tested an adaptation and extension of the theory of planned behavior (Ajzen, 1991), based on recommendations by Marlatt (1985). Specifically, positive and negative smoking expectancies were hypothesized to moderate the relationships of social norms and self-efficacy with smoking intentions and, and for self-efficacy only, smoking behavior. Factor analysis assessed the discriminant validity of the measures. Using multiple regression analyses, cross-sectional, self-report questionnaire data from 25,868 sixth through twelfth grade students were used to test the hypotheses. Consistent support was found for the additive effects predicting intentions to smoke and daily smoking. For the interactive effects, moderate support was found predicting intentions, but not daily smoking. Likewise, moderate support was found for school level and smoking status differences in these relationships. These findings are discussed in terms of their theoretical implications regarding the role and etiology of expectancies within the theory of planned behavior, social cognitive theory, and previous conceptualizations of risk and protective interactive effects. Additionally, these results have program implications regarding the prevention of adolescent smoking through the alteration of smoking expectancies.

CHAPTER 1

INTRODUCTION

Adolescent cigarette smoking (ACS) can pose serious health risks. Every day 3000 American adolescents start smoking (Centers for Disease Control and Prevention, 1995) and, in turn, increase their risk for developing chronic obstructive pulmonary disease; lung, head, neck, urinary, bladder, kidney, cervical, and pancreatic cancers; arrhythmia; aortic aneurysms; and skin, orthopedic, neurological, visual, endocrine, and immune disorders (Shopeland & Burns, 1993). The magnitude of these potential risks can be illustrated by national surveys suggesting that from 1975 to 1999, cigarettes were the substance most frequently used by adolescents on a daily basis, more than alcohol, marijuana, or cocaine (Johnston, O'Malley & Bachman, 1999). In addition, national surveys indicate that cigarette smoking among adolescents in 8^{th}, 10^{th}, and 12^{th} grades increased and peaked from 1992 to 1996, and declined only slightly in 1997, 1998 and 1999 (Centers for Disease Control and Prevention, 2000). Finally, the Centers for Disease Control and Prevention (2000) estimate that almost five million adolescents who began smoking in 1998 and 1999 will die prematurely because of the health risks associated with cigarette smoking. Due to the powerful health risks of ACS, many researchers have attempted to understand why adolescents use cigarettes.

In an effort to understand ACS, researchers have identified many factors that are associated with ACS, including societal, parent, peer, and attitudinal variables. However, while nearly a half a century of research suggests that certain variables are associated with ACS, this research has failed to answer why adolescents smoke, from the

perspective of the adolescent. This research has not adequately identified the processes or mechanisms involved in smoking that explain how certain variables (e.g., self-efficacy, societal norms) are related to ACS (Brandon, Juliano, & Copeland, 1999). In order to answer this question, researchers have recently begun to posit a cognitive construct called expectancy (to be defined later) as a potential proximal risk factor for ACS (Brandon & Baker, 1991). However, most of the empirical research investigating expectancies and smoking behavior has examined only direct and linear relationships, and has not examined more elaborated theoretical models in which expectancies may be related to other psychosocial variables as potential moderators (Marlatt, 1985).

The purpose of this dissertation is to build on existing literature by examining whether expectancies moderate relationships between certain psychosocial variables and ACS, testing an adaptation and extension of Ajzen's (1991) theory of planned behavior (TPB). Before describing these hypothesized relationships in more detail, this introductory chapter gives a general description of the expectancy construct, followed by three sections discussing its origins, definition and theoretical meaning, and theoretical application. Next, research examining the relationships of the expectancy construct with substance use is discussed, followed by a section presenting an adapted and extended version of TPB that is used to guide the hypotheses to be tested in this dissertation.

What is the Expectancy Construct?

Expectancies have been conceptualized as developing from people's attempts to give meaning and understanding to their lives (Bolles, 1972). To elaborate, when people cognitively organize, categorize, or label aspects of their life such as objects and events

involving themselves and other people, they develop if-then hypotheses about the relationships surrounding these objects and events (i.e., if A happens, then B will follow). These if-then hypotheses can be called expectancies and are thought to develop as people attempt to explain events that they have experienced, as well as to predict similar events in the future. Expectancies are suggested to have a major impact on the construal of subsequent events in similar situations such that people expect their if-then hypotheses to be true, and may behave accordingly. As such, expectancies may influence how people behave in particular situations (Goldman, Brown, & Christiansen, 1987).

People may also consistently display the same behaviors in similar situations based on the expectancies they have developed for those particular situations. This view is congruent with a biological conceptualization of expectancies offered by Goldman, Darkes, and Boca (1999), who defined expectancies as information about relationships between objects or events (e.g., relaxation follows smoking) that is stored in the nervous system and processed to produce behavioral output (e.g., smoking cigarettes) in future situations.

To illustrate, an adolescent's first experience with cigarettes may be that of observing someone on TV, a parent, or a peer becoming more relaxed after smoking during a stressful situation. In turn, the adolescent may develop vicariously an expectancy (Goldman et al., 1999), or an information template stored in the nervous system, such that he or she expects a relaxing feeling to follow the act of smoking a cigarette. Based on this vicariously learned expectancy, the adolescent may try smoking a cigarette and subsequently experience a relaxing feeling, thus substantiating the

expectancy. This direct experience may reinforce the vicariously learned expectancy for relaxation, which may be considered a positive outcome by the adolescent. Consequently, the adolescent may behave in accordance with this expectancy. That is, the adolescent may smoke cigarettes based on a strong expectancy that if he or she smokes a cigarette, then he or she will become more relaxed.

These types of if-then expectancies about events in the world arguably are an important function of understanding of people's daily lives. As such, the expectancy construct is intuitively appealing to many researchers as an explanation of behavior in many domains (Brandon et al., 1999; Goldman et al., 1987), and has a long history of being a part of many theories of behavior within the field of psychology. The following section briefly discusses this history.

Origins of the Expectancy Construct

The origins of the expectancy construct can be traced to ideas outlined in Tolman's (1932) book entitled, "Purposive Behavior in Animals and Man". Tolman argued that the explanation of learning and human behavior required examining stimulus-response sequences followed by reinforcement as well as consideration of cognitive variables such as expectations about certain stimulus-response-reinforcement sequences. However, he did not explicitly describe how expectancies were involved in a stimulus-response-reinforcement sequence. For example, how expectancies predicted responses (i.e., behavior) in the presence of a particular stimulus was not discussed. As a behaviorist, Tolman described only observable constructs in relation to the actual learning of stimulus-response-reinforcement sequences.[1] It should be noted that

Tolman's ideas, while based in behaviorism, represented a form of behaviorism that gave consideration to cognitive variables such expectancies, although how expectancies were involved in the stimulus-response-reinforcement sequence was not clearly described (MacCorquodale & Meehl, 1954). Due to his consideration of cognitive variables, Tolman's (1932) ideas were not shared or endorsed by all behaviorists such as Skinner (1938), who suggested that behavior could be explained only by the learning of observable stimulus-response-reinforcement associations with no consideration of the role of an unobservable construct such as expectancies.

Tolman's (1932) theory was expanded by MacCorquodale and Meehl (1954) who defined the expectancy construct as the learning of knowledge about specific stimulus-response-reinforcement sequences that could activate behavior. They argued that an individual may develop (or learn) an expectancy regarding a relationship among a particular stimulus, response, and an expected reinforcement based on previous experience with that stimulus-response-reinforcement sequence. That is, in the presence of a certain stimulus an individual may respond (i.e., behave) in a certain way in order to receive reinforcement. In turn, if the strength of the expectancy is high enough, he or she may behave in such a way as to elicit such a response outcome whenever he or she encounters that particular stimulus. This view of expectancies, like Tolman's (1932), was not accepted by all behaviorists (e.g., Skinner, 1953) as it represented "some (different) form of the S-R-reinforcement theory" (MacCorquodale & Meehl, 1954, p. 63). MacCorquodale and Meehl also posited that individuals may develop expectancies vicariously without actually engaging in the stimulus-response sequence. In particular,

they suggested that individuals can develop or learn expectancies by observing stimulus-response-reinforcement sequences.

Also in 1954, Rotter expanded the expectancy construct to include the idea of subjective probability within his social learning theory of behavior. Rotter contended that individuals' expectancies varied according to subjective probabilities, or the likelihood that particular behaviors would produce certain reinforcing outcomes within specific situations. Rotter also argued that these probabilities are based on previously experienced behavior-reinforcement sequences or events, and that expectancies could be generalized to other similar behavior-reinforcement sequences by using common sense or cultural knowledge about the similarities of stimuli in two different situations. Like Tolman (1932) and MacCorquodale and Meehl (1954), Rotter (1954) posited that expectancies, or learned knowledge about a particular behavior-reinforcement outcome association, could be used to explain behavior. As previously mentioned, these ideas were opposed by behaviorists such as Guthrie (1935) and Skinner (1953), who rejected the idea that cognitive constructs were involved in learning, or could produce behavior.

Two decades later, Bolles (1972) expanded on these ideas by suggesting that the expectancy construct should not be conceptualized merely as knowledge about a stimulus-response-reinforcement sequence, where behavior and/or reinforcers are always a necessary part of the development of an expectancy. Rather, the expectancy construct should be conceptualized in two ways: (1) acquired (i.e., observed or experienced) knowledge about a certain stimulus in the environment that produces a certain outcome, where a behavioral response is not always necessary (e.g., the sun makes an individual

feel warm), and (2) acquired (i.e., observed or experienced) knowledge about an individual's own behavior that produces a certain outcome, where behavior is necessary to produce the outcome (e.g., if an individual moves around a lot, his or her body will feel warm). For both kinds of expectancies, Bolles suggested that reinforcement often accompanied the development or learning of these expectancies, but that it was not a necessary condition for expectancies to develop.

Bolles (1972) argued further that the behaviorist process of associative learning (e.g., Skinner, 1938) does not explain why these two types of expectancies develop. According to Bolles, individuals do not respond (i.e., behave) automatically or mechanistically to a stimulus without thinking. Instead, stimulus-response and behavior-outcome associations are learned as expectancies, or stored information in the nervous system that is recalled mentally to produce behavioral output (Bolles, 1972), and not learned as histories of mechanical and automatic reinforcement schedules (Skinner, 1953). Bolles also rejected the fundamental assumption of behaviorism, which suggested that learning within the stimulus-response-reinforcement sequence required the learning of a response accompanied by reinforcement (Guthrie, 1935; Skinner, 1938).

Thus, by calling for the replacement of the associative concept of reinforcement with the concept of expectancy for explaining stimulus-response and behavior-outcome sequences, Bolles, along with the contributions of other major theorists, helped the expectancy construct to become a key concept in the understanding of learning and to be viewed as a construct that may influence many behaviors (Goldman et al., 1999).

Defining Expectancies

Bolles (1972) defined the expectancy construct as anticipatory knowledge of conditional relationships between objects or events such as stimuli, responses, or outcomes in a forthcoming situation. This dissertation also defined expectancies in this manner.

Place of Expectancies in Psychological Theories

The theoretical meaning of expectancies is perhaps best understood in its application and integration into other theories. In particular, the expectancy construct may be best understood not as an expectancy theory per se, or as comparable to larger theoretical frameworks such as social learning theory (Bandura, 1977) or TPB (Ajzen, 1991), but as a psychological construct that has been applied to and used in many psychological theories. This idea is supported by Maddux (1999), who stated the "utility of (expectancies) is greatly enhanced when it is placed in the context of a general model or theory" (p. 18), and expectancies have been included in many social cognitive theories.

Social learning and social cognitive theories. As a central concept in the understanding of learning, the expectancy construct has been applied to a variety of theoretical domains. For example, in addition to the theories already mentioned (e.g., Tolman, 1932; Rotter, 1954), Bandura (1977) integrated the expectancy construct within social learning theory. Specifically, Bandura described expectancies within two categories that he argued were conceptually related: outcome expectancies and efficacy expectancies. Outcome expectancies were described as an individual's expectancies about relationships between particular behaviors and desired outcomes; efficacy expectancies referred to an individual's beliefs that he or she could perform these

particular behaviors in order to achieve the desired outcomes. Outcome expectancies, based on Bandura's social learning theory (1977), have been studied a great deal in the area of substance use (to be discussed later).

The expectancy construct has also been applied to the study of social cognition (Janoff-Bulmann & Brickman, 1999; Kirsch, 1999; Raynor, 1981). For example, in the domain of information feedback, Janoff-Bulmann and Brickman (1999) examined how expectancies contributed to learning when people failed to achieve a certain task. More specifically, they investigated how reactions to "failure" could be maladaptive when people held expectancies of failure or expectancies of success. For example, if people held expectancies of failure upon attempting to achieve an easy task (e.g., applying for a job), it might be considered maladaptive for them to stop trying to achieve. Similarly, if people held expectancies of success upon attempting to accomplish an impossible task (e.g., unsolvable problem), it could be maladaptive for them to keep trying.

In the domain of organizational psychology, expectancies predicted occupational choices for nurses (Sheridan, Richards, & Slocum, 1975), job preferences (Dillard, 1979), and job turnover (Cumming & Johnson, 1977). More recently, outcome expectancies have been applied to the domain of substance use (Brandon & Baker, 1991; DiClemente, Prochaska, & Gibertini, 1985; Jaffe, 1992; Leigh, 1989), most often focusing on alcohol expectancies (Goldman et al., 1987).

Alcohol expectancies. Based on Bandura's (1977) definition of outcome expectancies, positive and negative alcohol expectancies have been defined as information about conditional relationships between alcohol consumption and certain

positive and negative outcomes, respectively (Adams & McNeil, 1991; Goldman et al., 1987). Support for the cross-sectional and longitudinal associations between positive and negative expectancies and alcohol consumption has been found in many empirical studies indicating that alcohol expectancies are some of the most powerful predictors of alcohol use as measured by a variety of drinking measures such as frequency, quantity, and drinking problems (Goldman, 1994; Goldman et al., 1999; Leigh, 1989).

Smoking expectancies. Similar to the research on alcohol expectancies, smoking expectancies have been defined as knowledge about conditional relationships between smoking tobacco and experiencing particular positive or negative outcomes. Much of the empirical research on this topic has examined the expectancy construct within social cognitive theories such as the theory of reasoned action (TRA) (e.g., Chassin, Presson, Sherman, & Edwards, 1991). Research on smoking among adolescents has found that positive and negative smoking expectancies are associated with ACS in expected directions, both within-time (e.g., Brandon & Baker, 1991; Covington & Omelich, 1988; Morgan & Grube, 1989) and across-time (e.g., Bauman & Chenoweth, 1984; Chassin et al., 1991). Also, positive smoking expectancies have been found to be more consistently associated with ACS than negative expectancies (Brandon et al., 1999).

However, these studies have been limited to testing direct and linear relationships between smoking expectancies and ACS, and have not empirically examined smoking expectancies within more complex moderational relationships as suggested by the theoretical ideas of Marlatt (1985) (to be discussed in the next sections). This dissertation attempts to build on the smoking expectancy literature, and to gain a better

understanding of ACS, by empirically examining the ideas of Marlatt (1985) as an adaptation from and extension of TPB. Before describing how TPB was adapted and extended to explain ACS, a discussion of this theory, and the empirical support for it, is provided, along with a discussion of the etiology of ACS as conceptualized by Flay, d'Avernas, Best, Kersell, and Ryan (1983). These discussions are provided to give relevant background information for understanding the proposed adapted and extended TPB as a model for predicting and understanding ACS.

The Theory of Planned Behavior

Ajzen's (1991) theory of planned behavior (TPB) was an extension of the theory of reasoned action (TRA), which was originally explicated in 1975 by Martin Fishbein and Icek Ajzen (see Figure 1). TRA suggested that behavioral intentions predict behavior, and that there are two determinants of intentions. The first determinant, attitudes towards performing a behavior were derived from the arithmetic product of two cognitive components: (1) expectancies, and (2) evaluations of the importance of those expectancies.[2]

The second determinant of intentions in TRA, social norms, was the social component that involved outside influences. Social norms were defined as the product of a person's: (1) beliefs about whether significant others think he or she should perform the behavior in question, and (2) motivation to comply with these others. The referent groups or individuals upon which social norms were based could be family, best friends, peer acquaintances, teachers, supervisors, community leaders or society at large. Motivation to comply could be based on the social power of the referent group, an

individual's need for approval by the referent group, or an individual's intention to comply with the referent group's expectations. Together, expectancies and social norms were posited to influence intentions directly, which in turn, influenced behavior (Fishbein & Ajzen, 1975).

An important assumption of TRA was that behaviors influenced by expectancies and social norms were under volitional control, where a person could perform or not perform a behavior based on his or her expectancies and social norms. However, the performance of many behaviors such as smoking cigarettes is also contingent on appropriate opportunities such as adequate financial resources (Ajzen & Madden, 1986). As such, TRA was limited in the range of behaviors (i.e., behaviors under complete volitional control) it could explain. To extend this range, Ajzen (1991) proposed TPB, which added the construct of self-efficacy to TRA. Self-efficacy, which was borrowed from Bandura's (1986) social cognitive theory, was defined as a person's belief about whether he or she could perform the behavior in question based on his or her own external (e.g., money) or internal (e.g., skills) resources. Unlike expectancies and social norms, self-efficacy was proposed to associate directly with intentions and behavior.

Empirical Support for the Theory of Planned Behavior

TPB has been used to predict many domains of behavior including health screening attendance (DeVellis, Blalock, & Sandler, 1990), exercise (Norman & Smith, 1995), alcohol use (Murgraff, McDermott, & Walsh, 2001), and smoking (Budd, 1986; Sutton, 1989). A recent meta-analysis of research using TRA and TPB reported that 40% to 50% of the variance in intention, and 19% to 38% of the variance in behavior, was

explained by these models (Sutton, 1998). In addition, two other comprehensive reviews of research testing TRA revealed that the predictions of intentions and behavior improved significantly with the addition of self-efficacy (Ajzen, 1991; Madden, Ellen, & Ajzen, 1992). Lastly, and of particular interest to this dissertation, the constructs of TRA and TPB have been regarded as some of the strongest and most consistent predictors of adolescent substance use, including smoking (Petraitis, Flay, & Miller, 1995).

Stages of Change in the Development of Adolescent Cigarette Smoking

Building on models of smoking initiation (e.g., Levanthal & Cleary, 1981) and empirical research on predictors of smoking behavior (e.g., Clausen, 1968; Jessor & Jessor, 1977; Levanthal & Everhart, 1979), Flay et al. (1983) developed a comprehensive stages of change model describing the development of adolescent smoking behavior. This model included four stages: (1) preparation, (2) initiation, (3) experimentation, and (4) regular use.[3]

Preparation

Flay et al. (1983) described the preparation stage as the early learning experiences in a child's environment that involve cigarette smoking. During this stage, children learn about smoking behavior vicariously through observation of other smokers, and directly through communication (e.g., advice) with parents and peers. Through these learning experiences, children develop expectancies about smoking.

Initiation

First-time smoking marks the entry into the initiation stage. Flay et al. (1983) asserted that adolescents may initiate smoking in order to gain social acceptance by or

reinforcement from their peers or, in a related manner, to define themselves as cool or mature in relation to their peers. Similarly, adolescents may initiate smoking as a way of engaging in an experimental activity with close friends (Schulenberg, Maggs, Steinman, Zucker, 2001).

Experimentation

Adolescents who persist through the initiation stage by continuing smoking are considered to be in the experimentation stage. Experimenters, compared to adolescents who do not continue to smoke through the initiation stage, most likely had a positive experience with their first cigarette, where they may have achieved positive social (e.g., increased peer acceptance) and/or physiological (e.g., increased heart rate) effects. They may have considered the initial harshness of the first cigarette to be a temporary problem that would eventually pass (Flay et al., 1983).

Regular Smoking

After repeated exposure to peer and physiological reinforcement of smoking, some adolescents will become habitual smokers and enter into the regular smoking stage. Flay et al. (1983) argued that the physiological effects of smoking, as compared to peer and parent effects, are the most important determinants of moving into this stage. For example, many habitual smokers may not experience only the positive reinforcement of feeling accepted by their peers or stimulated after smoking, but also the negative reinforcement of feeling relaxed after having addictive cravings reduced through smoking (Levanthal & Cleary, 1981).

Adapting and Extending the Theory of Planned Behavior for Smoking Behavior: More than an Additive Relationship?

As previously mentioned, TPB proposed that behavior could be explained by behavioral intentions, which in turn were explained by expectancies, social norms, and self-efficacy. An important theoretical tenet of TPB was that all of these relationships are additive in nature (Ajzen, 1991), and therefore, TPB did not consider possible interactions of its constructs with other psychosocial variables in the prediction of behavior. In this dissertation, it is argued that an adapted and extended TPB should consider interactive relationships among its constructs.

Marlatt (1985) argued that expectancies may moderate the relationships of intrapersonal constructs and contextual cues (e.g., self-efficacy to abstain from drug use and social norms, respectively) with drug use. Marlatt proposed a comprehensive and complex model involving contextual influences, behavioral coping skills, physiological urges, self-efficacy, and various other cognitive constructs as predictors drug use. Although a complete description of all the relationships posited by this model is beyond the scope of this dissertation, the part of the model involving expectancies, self-efficacy, and contextual influences is emphasized. Within his model, Marlatt contended that the influence of contextual cues (e.g., social norms) and self-efficacy on cigarette use may vary according to the level of positive or negative expectancies. For example, the positive effect of peer social norms on cigarette use may be stronger when combined with higher positive expectancies. The idea that expectancies may interact with social norms and self-efficacy in their prediction of substance use leads to an important adaptation to

TPB. The hypotheses to be tested in this dissertation, therefore, are based on such an adapted and extended version of TPB, which proposes both additive and interactive relationships between the predictors and ACS intentions and behavior. This extended model is presented at the end of Chapter 2.

Next, Chapter 2 reviews the empirical literature linking social norms and self-efficacy with ACS. Following this literature review, the hypothesized models are presented. Chapter 3 then describes the method that was used. Self-report questionnaire date were collected from students in Grades 6 through 12 participating in the Texas Tobacco Prevention Initiative Youth Tobacco Survey (McAlister, 2001). These data consist of adolescents' reports of: (1) positive smoking expectancies, (2) negative smoking expectancies, (3) social norms, (4) self-efficacy to abstain from smoking, and (5) intentions to smoke, and (6) their own smoking behavior.

CHAPTER 2

LITERATURE REVIEW

Chapter 2 consists of a literature review that builds a logical conceptual argument for the hypothesized models. Sections discuss: (1) how smoking expectancies, social norms, and self-efficacy are empirically related to ACS; and (2) how smoking expectancies may be conceptually related to these psychosocial variables and ACS within an adapted and extended version of TPB, based on Marlatt (1985). Finally, the hypothesized models are presented.

The empirical literature examining the associations between intentions to smoke and ACS is not be reviewed, as many comprehensive reviews have shown that intentions are strong predictors of behaviors in general, including smoking behavior (Ajzen, 1991; Conner & Armitage, 1998; Godin & Kok, 1996; Randall & Wolff, 1994). As previously mentioned, intentions predict 19% to 38% of the variance in smoking behaviors (Sutton, 1998). According to Cohen (1992), these effects would be characterized as moderate.

The Expectancy Construct

Measurement of Smoking Expectancies

As discussed in Chapter 1 (pages 20 and 21), smoking expectancies are defined as anticipatory knowledge of conditional relationships involving smoking-related stimuli, responses, or outcomes (e.g., Bolles, 1972; Kirsch, 1985). Measures of smoking expectancies typically include various content domains such as social facilitation, mood, appearance, and health. For example, common items measuring positive smoking expectancies are, "Smoking helps me to be accepted by my peers" (i.e., social

facilitation), "Smoking helps me to relax" (i.e., mood), and "Smoking helps me look more attractive" (i.e., appearance) (e.g., Covington & Omelich, 1988; Loken, 1982). Common items assessing negative health-related smoking expectancies are, "If I smoke, it will harm my health," and "If I smoke, I will get cancer" (e.g., Bauman & Chenoworth, 1984; Brandon & Baker, 1991).[4]

Social Cognitive Theories: Associations of Smoking Expectancies with Smoking Behavior

Many studies have examined smoking expectancies and ACS from a social cognitive perspective (e.g., Brandon & Baker, 1991; Chassin et al., 1991). Of these studies, some have assessed independent effects of smoking expectancies on ACS by controlling for the effects of other psychosocial variables (e.g., Chassin et al., 1991; Morgan & Grube, 1989), while others have provided empirical evidence for the associations of smoking expectancies and ACS without consideration of how other psychosocial constructs might have impacted this relationship (e.g., Brandon & Baker, 1991; Loken, 1982). Both types of studies are discussed in the next two sections.

Independent effects of smoking expectancies on smoking behavior: Comparisons with other constructs. Morgan and Grube (1989), in a cross-sectional study of 2782 adolescents from Dublin aged 13 to 17 years old, found that positive and negative smoking expectancies were significant predictors of ACS even when the effects of social norms (parent and peer approval) and attachment to society were controlled. Overall, more variance was accounted for by negative than positive expectancies. In addition, smoking expectancies interacted with age such that the importance of negative

expectancies was greater among older adolescents and the importance of positive expectancies was greater among younger adolescents.

In a longitudinal study of over 1000 students in Grades 6 through 12, Chassin et al. (1991) found that positive and negative expectancies predicted smoking initiation above and beyond variables such as friends smoking as posited in Problem Behavior Theory (PBT) (Jessor & Jessor, 1977). Logistic regression analyses, which were conducted separately for middle school (Grades 6 to 8) and high school (Grades 9 to 12) students, revealed that positive and negative expectancies (as reported by high school non-smokers in 1980) predicted smoking initiation (i.e., measured dichotomously as smoking or not smoking) by 1981 (ßs = .40, and -.66., respectively, both $p < .05$,), and in 1987 just for positive expectancies (ß = .50, $p < .01$). Positive and negative smoking expectancies of non-smoking middle school students in 1980 were not found to predict smoking initiation by 1981 or 1987.

The results of both Morgan and Grube (1989) and Chassin et al. (1991) suggest that smoking expectancies are unique predictors of ACS and initiation within theoretical models such as PBT (Jessor & Jessor, 1977) and TRA (Fishbein & Ajzen, 1975). Additionally, their findings indicate that negative expectancies may be better predictors of smoking initiation and behavior among older adolescents and, just for Morgan and Grube (1989), the findings indicate that positive smoking expectancies may be better predictors of smoking initiation among younger adolescents.

Bivariate associations of smoking expectancies with smoking behavior. Brandon and Baker (1991) tested Marlatt's (1985) motivational theory of drug use in a sample of

college students. Marlatt proposed that people use drugs to experience positive consequences and abstain from drug use to avoid negative consequences. In the model, positive and negative expectancies were defined as people's knowledge regarding the likelihood of experiencing or avoiding drug-related consequences. Consistent with this process, Brandon and Baker (1991) found that daily smokers had significantly higher positive and lower negative expectancies than ex-smokers, triers, and abstainers. In another study, Loken (1982) made similar predictions about positive and negative expectancies and ACS based on TRA. Using analysis of variance, results supported the hypotheses for positive expectancies and negative expectancies, as well as the other constructs, across different groups of heavy, light, and non-smokers. These latter two studies provide empirical evidence consistent with Marlatt's (1985) assertion that people who hold higher positive smoking expectancies will smoke more than people who hold lower levels of positive smoking expectancies.

Non-Social Cognitive Perspectives on the Associations of Smoking Expectancies with Smoking Behavior

Other studies have not utilized a social cognitive perspective when examining the relationships between smoking expectancies and ACS. Moreover, these studies did not use any theoretical framework to help guide their hypotheses and interpret their findings. However, despite the lack of a theoretical framework, their findings are useful in that they can be interpreted as supportive of the hypothesized relationships of this dissertation. These types of studies are discussed next.

Associations of smoking expectancies with different smoking groups. In Gordon

(1986), which involved 2339 students in Grades 6 and 8, analyses of variance (ANOVA) revealed that groups that smoked more (heavy smokers, triers) reported significantly higher positive expectancies and lower negative expectancies than other groups that smoked less (ex-smokers, non-smokers). Positive expectancies were more consistently associated with significant differences among groups than negative expectancies. Covington and Omelich (1989), using a sample of more than 5000 students in Grades 6 through 10, found similar findings distinguishing types of smokers and non-smokers with regard to positive smoking expectancies. These authors did not measure negative smoking expectancies. Lastly, Downey and O'Rourke (1976), using a sample of 2096 seventh grade students, found that smokers reported significantly higher mean levels of positive smoking expectancies (among males and females) and lower levels of negative expectancies (among males only) than non-smokers.

These studies can be interpreted as supportive of Marlatt's (1985) hypotheses about main effects of expectancies on smoking by suggesting that adolescents who want to experience the positive consequences of smoking engage in smoking more than adolescents who do not want to experience positive consequences of smoking (or who want to avoid the negative consequences).

Associations between smoking expectancies and smoking initiation. Bauman and Chenoworth (1984), in a sample of 1406 eighth grade non-smokers, found that positive and negative smoking expectancies were associated with smoking initiation one year later (βs = .40 and -.23, both $p < .001$). Likewise, in a short-term longitudinal study of 1390 non-smoking adolescents aged 12 to 13 years, Charlton and Blair (1989) found that

positive, but not negative, smoking expectancies among female non-smoking adolescents were significantly associated with smoking initiation over time [betas not reported]. No significant relationships were found for males.

In summary, all of the studies discussed in the above sections support for the theoretical ideas of Marlatt (1985), who argued that positive and negative smoking expectancies can be used as measures of adolescents' desire to experience or avoid the consequences of smoking, respectively, which then may predict ACS. Moreover, Chassin et al. (1991) and Morgan and Grube (1989) demonstrated that expectancies predict ACS independently of other constructs within larger theoretical frameworks such as TRA. In addition, the results of Morgan and Grube support the idea of examining potential interactive roles that expectancies may have in the prediction of ACS within an adapted and extended TPB.

Social Norms

Social Norms: Definition and Measurement

Fishbein and Ajzen (1975) defined social norms as a person's belief or knowledge regarding whether a referent group or an individual from a referent group thinks that he or she should engage in a certain behavior. Most researchers have followed this conceptualization by measuring social norms as the number of people in a person's referent group that engage in or approve of the targeted behavior being examined (e.g., Ajzen, Timko, & White, 1982; Chassin et al., 1991; 1987; DeVries, Kok, & Dijkstra, 1990; Eiser & van der Pligt, 1984; Grube, Morgan, & McGree, 1986).

In like manner, this dissertation defines social norms as the number of people in an

adolescent's peer referent group that engage in ACS.

Social Cognitive Theories: Associations of Social Norms with Smoking Behavior

Many studies have used TRA or TPB to examine ACS. Accordingly, these studies have examined smoking expectancies and social norms together when attempting to explain ACS (e.g., Chassin et al., 1991; DeVries et al., 1988; Grube et al., 1986). The next section reviews these types of studies, although the emphasis is on social norms as much of the empirical literature on smoking expectancies has been reviewed previously.

Independent effects of social norms on smoking behavior: Comparisons with other constructs. In a cross-sectional study designed to test TPB, DeVries, Dijkstra, and Kuhlman (1988) administered questionnaires to Dutch adolescents aged 14 to 17 years of age, which included assessment of smoking expectancies, social norms (i.e., defined as parental and peer approval of ACS), and self-efficacy. Supporting TPB, smoking expectancies ($\beta = .66$, $p < .001$), social norms ($\beta = .22$, $p < .05$), and self-efficacy ($\beta = .43$, $p < .001$) were significantly uniquely associated with intentions to smoke. As discussed previously, Chassin et al. (1991) examined how adolescents' expectancies and social norms (Fishbein & Ajzen, 1975) and other variables from PBT (Jessor & Jessor, 1977) might be related to smoking initiation across a one-year and a six-year time interval. Social norms, which were measured by assessing adolescents' perceptions of the frequency of their five best friends' smoking behavior, of non-smoking middle school adolescents in 1980 were positive predictors of smoking initiation by 1987 ($\beta = .47$, $p < .01$).

In two similar studies, Eiser, Morgan, Gammage, & Gray (1989) and Grube et al.

(1986) found that smoking expectancies, social norms (i.e., adolescents' perceptions of parent and peer approval), and behavioral norms (i.e., adolescents' perceptions of the smoking behavior of their parents and peers) independently predicted ACS (ßs ranged from .15 to .47, all $p < .05$). These findings suggest that adolescents may smoke not only based on their expectancies of smoking and perceived social norms (Fishbein & Ajzen, 1975), but also may smoke due to modeling or vicarious learning of referent group behavior. These studies demonstrated the utility of an extended version of a TRA to explain ACS.

Non-Social Cognitive Perspectives: Differences in Smoking Expectancies and Social Norms Between Smoking Groups

Of the studies examining associations of expectancies, social norms, and ACS, only a few have not been based on the social cognitive TRA (e.g., Eiser & van der Pligt, 1984). However, these studies suggest that smoking expectancies and social norms are significantly associated with ACS. For example, Eiser and van der Pligt (1984), Oei and Burton (1990), and Schneider and Vanmastrigt (1974), using similar a measure of social norms that assessed referent group approval of ACS, found that heavier smokers reported more positive social norms than light or non-smokers.

Together, these studies are consistent with the assertions of TRA, as they suggest that adolescents with more positive perceptions of social norms are more likely to initiate and continue smoking than adolescents with less positive perceptions of social norms. Moreover, consistent with TRA (Fishbein & Ajzen, 1975), these results provide empirical support for additive relationships of social norms and expectancies with ACS. Based on

TRA and past empirical research, therefore, this dissertation hypothesizes that social norms, in this case peer smoking, and smoking expectancies independently predict intentions to smoke. In addition, interactions among these variables are hypothesized and are tested. This issue is discussed in more detail following the next section.

How Are Expectancies and Social Norms Related to Smoking Behavior: More than an Additive Relationship?

TPB assumes that the relationship of social norms with behaviors such as smoking is additive, and does not consider any possible interactive relationships that social norms may have with other variables (Ajzen, 1991). However, based on the ideas of Marlatt (1985), it could be asserted that expectancies moderate the relationship between social norms and ACS. As an extension of TPB, this dissertation argues that smoking expectancies may moderate the relationships between social norms and behavioral intentions to smoke.

Marlatt contended that the influence of contextual cues (e.g., social norms) on cigarette use may vary according to the level of positive or negative expectancies. For example, the positive effect of peer social norms on cigarette use may be stronger when combined with higher positive expectancies. To illustrate, adolescents may perceive that their peers hold positive social norms regarding smoking and that many of their peers engage in ACS, believing that ACS is socially acceptable (Chassin et al., 1991). Moreover, adolescents may be motivated to comply with their peers' social norms based on their own need to gain peer approval (Ajzen, 1991). Therefore, adolescents may develop intentions to smoke based on the social norms of their peers. Additionally, many

of these adolescents may have also developed positive smoking expectancies about smoking either vicariously or through direct smoking experience (Bandura, 1986). Consequently, they may have developed intentions to smoke in order to receive the positive effects of smoking. The combined conditions of higher exposure to peer smoking with higher positive expectancies in adolescents may accentuate the positive effect of peer smoking on intentions to smoke, more than its additive effect alone (see Figures 2 and 3).

To elaborate, adolescents' higher positive expectancies may amplify the positive effect of peer smoking within an environment comprised largely of peer smokers. A similar argument is proposed for negative smoking expectancies, which are hypothesized to moderate the relationship between peer smoking and intentions to smoke. In this case, however, the moderating effect is in the opposite direction (see Figures 5 and 6). That is, the effect of peer smoking on intentions is hypothesized to be weaker among adolescents with higher negative expectancies. Opposite to the intensifying properties of positive expectancies, negative expectancies may de-accentuate or weaken the positive effect of peer smoking on intentions to smoke, more so among adolescents with higher, and not lower negative expectancies.

Hence, consistent with these ideas which are based on Marlatt (1985), it is hypothesized that positive smoking expectancies moderate the relationship between social norms and intentions to smoke such that the relationship between social norms and intentions to smoke will be stronger among adolescents with higher positive smoking expectancies. Moreover, it is hypothesized that negative expectancies moderate the

relationship between social norms and intentions to smoke such that the relationship between social norms and intentions to smoke will be weaker among adolescents with higher negative expectancies.

The Construct of Self-Efficacy

Self-Efficacy: Definition and Measurement

Consistent with previous research examining the relationship between self-efficacy to abstain from smoking (hereafter referred to as self-efficacy) and smoking behavior (e.g., Brod & Hall, 1984; DeVries et al., 1990; Garcia, Schmitz, & Doerfler, 1990), this dissertation defines and measure self-efficacy as a belief that one can successfully abstain from ACS when exposed to internal (e.g., desire to feel relaxed) or external (e.g., peer) pressures to smoke. This definition is based on Bandura's (1977) general definition of behavioral self-efficacy, which is the belief that one can successfully complete a behavior that is required to produce a certain outcome. Additionally, this definition of self-efficacy to abstain from smoking (as opposed to self-efficacy to do a certain behavior)

Social Cognitive Theories: Associations of Self-Efficacy with Smoking Behavior

The majority of research examining the association between self-efficacy and smoking behavior (in general) has been based on Bandura's social cognitive theory (1986) (e.g., Baer, Holt, & Lichtenstein, 1986; Yates & Thain, 1985) or Ajzen's (1991) TPB (e.g., DeVries et al., 1988; DeVries et al., 1990). However, relatively little of this research has examined these associations among adolescents (e.g., Becona, Frojan, & Lista, 1988; DeVries et al., 1988; Garcia et al., 1990). Therefore, the next sections

review studies that have examined this relationship in adolescents and adults, with the assumption that examining this relationship in adults may bring insight into how self-efficacy is related to smoking behavior in adolescents. It should be noted that TPB places self-efficacy, as conceptualized by Bandura (1986), within a theoretical framework of expectancies, social norms, intentions, and behavior. Accordingly, empirical support to be reviewed in the next sections for the relationship of self-efficacy and smoking behavior are consistent with that portion of TPB.

The theory of planned behavior: Associations of self-efficacy with smoking behavior. As previously mentioned, DeVries et al. (1988) found support for TPB such that self-efficacy significantly added to the prediction of smoking intentions (β = -.43, p < .001) above and beyond expectancies (β = .66, p < .001) and social norms (β = .22, p < .05). Self-efficacy also explained unique variance in ACS (β = -.40, p < .001) above and beyond the variance contributed by intentions (β = .74, p < .001). Similar support comes from a longitudinal sample of Dutch high school students (DeVries et al., 1990). Replicating DeVries et al. (1988), the 1990 results indicated that initial assessments of self-efficacy and intention were the best predictors of ACS one year later, with self-efficacy and intentions predicting 24%, and intentions predicting 41%, of the variance in ACS, both p < .05. The results of both of these studies suggest that the construct of self-efficacy, like the construct of expectancies as shown in Chassin et al. (1991), can significantly add to the predictive as well as the explanatory power of a model based on TRA (Fishbein & Ajzen, 1975). More specifically, these findings suggest that adolescents who reported higher levels of self-efficacy believed they could successfully

abstain from smoking, and subsequently may have smoked less.

Bandura's social cognitive theory: Associations of self-efficacy with smoking behavior. In a sample of 92 subjects, Yates and Thain (1985), consistent with Bandura's assertion that self-efficacy was one of the most powerful predictors of behavior, found that self-efficacy accounted for approximately 13% of the total variance in ACS. This was almost half of the total variance (i.e., 23.4%) accounted for by the full set of predictors, which included ideal weight estimate and level of motivation to quit. Similarly, self-efficacy was the best retrospective predictor (i.e., participants were asked to recall their self-efficacy level from one year earlier) of current smoking status (i.e., relapser versus non-relapser). Similarly, in two prospective short-term questionnaire studies testing Bandura's (1986) self-efficacy hypothesis, Baer et al. (1986) and Garcia et al. (1990) found that self-efficacy was significantly associated with smoking behavior over time among adults, after controlling for previous smoking behavior. Furthermore, Garcia et al. found that self-efficacy to abstain from smoking ($\beta = -.13$, $p < .05$) predicted smoking behavior just as well as prior smoking behavior ($\beta = .14$, $p < .05$).

In summary, the studies reviewed in this section have shown self-efficacy (Bandura, 1977) to be a consistent predictor of ACS within theoretical frameworks such as TRA. Higher levels of self-efficacy are associated with lower levels of smoking (e.g., Becona et al., 1988; DeVries et al., 1990; Garcia et al., 1990), even after controlling for prior smoking.

The Association Between Self-Efficacy and Smoking Behavior: More Than an Additive Relationship?

As already mentioned, TPB does not posit any interactive relationships between its constructs in the prediction of intention or behavior. However, based on the ideas of Marlatt (1985), this dissertation extends TPB by examining the interactive relationship of smoking expectancies with self-efficacy in the prediction of intentions to smoke. Specifically, in this dissertation it is hypothesized that smoking expectancies will moderate the relationship between self-efficacy and behavioral intentions to smoke, as well as the relationship between self-efficacy and ACS, such that the relationship between self-efficacy and smoking intentions and behavior will be stronger among adolescents with higher negative expectancies.

Marlatt (1985) argued that the influence of interpersonal constructs such as self-efficacy on drug use may vary according to the level of positive or negative expectancies. For example, the negative effect of self-efficacy to abstain from drug use on cigarette use may be stronger when combined with higher negative expectancies. To elaborate, adolescents may believe they can resist internal (e.g., desire to feel relaxed) and external (e.g., peer pressure) temptations to smoke. In addition, they may have developed higher negative expectancies based in part on their parents' discouragement of smoking and their own observations of peers coughing after smoking, which adolescents may perceive as a negative outcome. The combined effects of higher self-efficacy with higher negative expectancies may amplify the negative effect of self-efficacy on intentions, more than its additive effect alone. That is, it is argued that the negative effect of self-efficacy to abstain from smoking on intentions to smoke may be intensified among adolescents with higher negative expectancies. In other words, the relationship between self-efficacy and

intentions to smoker may be stronger among adolescents reporting higher levels of negative expectancies (see Figures 5 and 7).

A similar relationship but in the opposite direction is hypothesized for positive expectancies (see Figures 2 and 4). Opposite to the hypothesized moderating effect of negative expectancies on the relationship between self-efficacy and intentions, positive expectancies are hypothesized to weaken it. That is, consistent with these ideas which are based on Marlatt (1985), positive smoking expectancies are hypothesized to moderate the relationship of self-efficacy with smoking intentions and ACS such that the effect of self-efficacy on intentions to smoke will be weaker among adolescents with higher positive smoking expectancies.

It should be noted that hypothesized positive and negative expectancies are represented separately in the Figures 2 to 7 in order to make the illustrations of the hypothesized relationships easier to understand. However, the adapted and extended TPB to be tested in this dissertation examined positive and negative expectancies simultaneously in the regression models.

Hypotheses

Given the many studies reviewed, which have established direct associations of expectancies, social norms, and self-efficacy with ACS within social cognitive theories (Ajzen, 1991; Bandura, 1986), this dissertation aims to add to this literature by testing moderational relationships involving these constructs and ACS (Marlatt, 1985). By doing this, one theoretical tenet of TPB is challenged. That is, TPB's assertion that all relationships are strictly additive in nature is questioned. The interaction hypotheses are

based on more complex models which suggest that expectancies moderate the relationships of social norms and self-efficacy with drug use, in this case cigarettes (Marlatt, 1985). In particular, positive and negative smoking expectancies are hypothesized to moderate the relationships of social norms and self-efficacy with intentions to smoke.

To elaborate, interactions are predicted such that the positive relationship of social norms with intentions to smoke will be stronger, and the negative relationship of self-efficacy with intentions to smoke and ACS will be weaker, among those adolescents with higher levels of positive smoking expectancies. The moderating effects of negative expectancies on these relationships are hypothesized to be opposite of those of positive expectancies (i.e., weaker and stronger, respectively). In sum, this dissertation challenges the additive relationship assumption of TPB by testing whether expectancies moderate the relationships of social norms and self-efficacy with adolescents' intentions to smoke. Three sets of hypotheses were tested in order to examine these relationships.

Additive Hypotheses

(1a) Adolescents with more positive smoking expectancies will report higher levels of intentions to smoke and ACS (see Figure 2).

(1b) Adolescents with more negative smoking expectancies will report lower levels of intentions to smoke and ACS (see Figure 5).

(1c) Adolescents who are exposed to higher levels of peer smoking in their schools will report higher levels of intentions to smoke (see Figure 2).

(1d) Adolescents who report higher levels of self-efficacy will report lower levels

of intentions to smoke and lower ACS (see Figure 2).

Moderational Hypotheses

(2a) Positive smoking expectancies and peer smoking will interact such that peer smoking will be more predictive of intentions to smoke among adolescents reporting higher positive expectancies (see Figures 2 and 3).

(2b) Negative smoking expectancies and peer smoking will interact such that peer smoking will be less predictive of intentions to smoke among adolescents reporting higher negative expectancies (see Figures 5 and 6).

(2c) Positive smoking expectancies and self-efficacy will interact such that self-efficacy will be less predictive of intentions to smoke and ACS among adolescents reporting higher positive smoking expectancies (see Figures 2 and 4).

(2d) Negative smoking expectancies and self-efficacy will interact such that self-efficacy will be more predictive of intentions to smoke and ACS among adolescents reporting higher negative smoking expectancies (see Figures 5 and 7).

Does School Level Moderate the Hypothesized Relationships?

Due to important developmental changes that occur during the middle and high school years (Larson, Richards, Monetta, Holmbeck, & Duckett, 1996; Schulenberg et al., 2001), there may be age or school level differences in the proposed relationships. For example, the additive and interactive relationships of positive and negative expectancies with intentions to smoke may be different for 6th grade students than for 12th grade students due to developmental differences such as levels of autonomy or characteristics of their peer relationships.

Morgan and Grube (1989) are the only authors to have examined directly whether the predictive strength of positive and negative expectancies on ACS varied according to age (see page 31). Results revealed interactions such that the predictive strength of negative expectancies was stronger for older adolescents, and the predictive strength of positive expectancies was weaker for older adolescents. These authors noted that with increasing age smokers perceived negative consequences of smoking as being less likely to occur to them. This phenomenon served to increase the difference in the level of negative smoking expectancies between smokers and non-smokers. The authors did not comment on how the relative levels of positive smoking expectancies between smokers and non-smokers changed with increasing age.

Consistent with Morgan and Grube (1989), Chassin et al. (1991) found that negative expectancies were more important than positive smoking expectancies in predicting smoking initiation among high school non-smokers over a one-year period (ßs = -.66 and .40., respectively). Although this finding did not directly address whether the predictive importance of positive and negative expectancies on ACS shifts across adolescence, it is suggestive of a possible trend. Positive expectancies, which emphasize social (e.g., social facilitation) and more short-term consequences (e.g., feeling relaxed) may be important to experimentation with cigarettes in earlier adolescence, but become less important with age as adolescents initiate regular smoking. Conversely, negative smoking expectancies, which emphasize more long-term health consequences, may become more important with age as adolescents, both smokers and non-smokers, consider the consequences of becoming a habitual smoker.

This view was supported by Chassin et al. (1991) who, in addition to examining whether positive and negative smoking expectancies predicted smoking initiation within their entire sample (see page 32), also examined separately the extent to which positive and negative expectancies predicted smoking initiation. In these analyses, positive social expectancies predicted smoking initiation in middle adolescence (i.e., by the end of high school), but not in late adolescence (i.e., after the end of high school). Negative expectancies for health-related consequences predicted smoking initiation in late adolescence, but not in middle adolescence.

Based on the limited literature on age or school level differences in the prediction of ACS, the following hypotheses were tested:

(3a) The main and moderating effects of positive smoking expectancies on adolescents' intentions to smoke and ACS will be stronger in middle school than in high school.

(3b) The main and moderating effects of negative smoking expectancies on adolescents' intentions to smoke and ACS will be stronger in high school than in middle school.

Does Smoking Status Moderate the Hypothesized Relationships?

To the best of this writer's knowledge, no studies have examined how the relationship of positive and negative expectancies with smoking intentions or other outcome variables related to ACS may vary according to smoking status. Indeed, as pointed out by Ary and Biglan (1988), most longitudinal studies have combined data from smokers and non-smokers when examining predictors of smoking onset and

smoking behavior (e.g., Pederson & Lefcoe, 1987 as cited in Ary & Biglan, 1988). This particular method may overlook factors that may uniquely predict smoking onset and/or continued smoking. By examining whether the relationships of positive and negative expectancies with smoking intentions vary according to smoking status, this dissertation may provide some insight on these issues. That is, if smoking intentions is viewed as a proxy for smoking onset among non-smokers and smoking behavior among smokers, then these analyses may provide insight into these issues.

Additionally, by examining whether expectancies predict smoking intentions among smokers and non-smokers, this dissertation was able to test (to some degree) the ideas of the social cognitive process of vicarious learning (Bandura, 1986) as described in Chapter 1. To recap, Bandura argued that expectancies, in this case adolescent smoking expectancies, may be initially formed through vicarious learning such as observing a peer becoming more relaxed after smoking during a stressful situation. Subsequently, adolescents' vicariously formed expectancy for relaxation may be reinforced by the direct experience of smoking a cigarette, where ACS may play a role in the development of expectancies. Therefore, when using cross-sectional data, it is difficult to know the correct specification of the direction of the model (i.e., expectancies predicting ACS or vice-versa).

However, by examining non-smokers, this dissertation was able to more appropriately test (to some extent) the hypothesis that expectancies predict ACS, or intentions to smoke as a proxy for ACS. That is, if such a significant relationship was identified among non-smokers, then support would be obtained that was consistent with

the influence of vicarious learned expectancies predicting ACS, where expectancies among non-smokers may not have developed from the direct experience of smoking. This procedure for evaluating the influence of social cognitive processes on alcohol use has been used by Christiansen, Goldman, and Inn (1982). No directional hypotheses are forwarded, although differences in the strength of the standardized beta coefficients between smokers and non-smokers was tested in order to address the above issues.

(4a) The main and moderating effects of positive smoking expectancies on adolescents' intentions to smoke will significantly differ in strength between smokers and non-smokers in both middle and high school.

(4b) The main and moderating effects of negative smoking expectancies on adolescents' intentions to smoke will significantly differ in strength between smokers and non-smokers in both middle and high school.

It should be noted that gender differences in the hypothesized relationships were considered as possible interactive effects. However, Flay et al. (1983) did not propose any gender differences in the etiology of smoking within their Stages of Change smoking model. Additionally, the Centers for Disease Control and Prevention (CDC) (2000) conducted a national youth tobacco survey of middle and high school students and found that males and females differed in their reported smoking prevalence rates by less than 1% (i.e., 9.6% for males and 8.8% for females), which was similar to the differences found in this dissertation (i.e., 13% for males and 11% for females). Therefore, gender differences were not expected or tested.

CHAPTER 3

METHOD

The data for the present study were gathered as part of a large-scale pilot study, the Texas Tobacco Prevention Initiative (TTPI), which aimed to identify ways for preventing tobacco use and promoting smoking cessation among Texans of all ages (Texas Department of Health, 2001). The TTPI was sponsored by the Texas Department of Health, which is currently receiving ten million dollars annually in tobacco settlement funds for the development of smoking prevention and intervention programs.

To develop the TTPI, the Texas Department of Health conducted community forums, focus groups, and one-to-one discussions with interested parties in university, business, and community settings. Based on feedback from these parties, a comprehensive network of organizations, comprised of universities, private businesses, law enforcement agencies, schools, and communities, was developed for the sole purpose of planning and evaluating treatment programs targeting youth and adult smoking. The goals of the TTPI were to: (1) identify which universal treatment programs (or combination of universal treatment programs) were most effective at preventing or reducing tobacco use among youth and adults, (2) assess how much funding for treatment programs was needed to obtain satisfactory effects, and (3) use this information to inform the Texas Legislature about how to most appropriately allocate funds from the tobacco settlement proceeds (Texas Department of Health, 2001). It should be noted that human subjects approval from the University of Texas, as well as from the University of Arizona, was obtained for the present data set.

Subjects

The present study was conducted using a youth-based sample that included data from students from 41 schools within rural and urban counties in central/southern Texas (Texas Department of Health, 2001). This sample was composed of 19 study sites (18 treatment and 1 control site) where five different types of youth-based-treatments (i.e., low level media, intensive media, law enforcement exposure, cessation training, school and community programs) were implemented. That is, these data were collected as baseline data for subsequent treatment. The entire sample of the TTPI was purposive in that project staff, using feedback from school representatives of the 19 research sites, chose the type of treatments to be given for each site.

Students were in Grades 6, 7, 8, 9, 10, 11, and 12 when they completed the Youth Tobacco Survey. Complete data across the seven grades were available for 25,868 adolescents with an average age of 14.5 years (SD = 1.98). The average response rate of all 40 schools was 70%. Of the entire sample, 41.8% were Caucasian, 19.7% were African American, 27.2% were Hispanic, 6.2% were Asian and 5.1% self-reported as an ethnicity other than Caucasian, African American, Hispanic, or Asian.

Procedure

Data were gathered by trained project staff who administered questionnaires to students during class periods. A wide variety of variables was assessed, including various adolescent characteristics such as positive smoking expectancies, self-efficacy and mood, and adolescent behaviors such as smoking and efforts to quit smoking. Adolescents were assured of the confidentiality of their responses by project staff.

Furthermore, on the front of the Youth Tobacco Survey, it was written that the students' answers were confidential, voluntary, and would not affect their class grade. Project staff were trained to answer student questions in a standardized manner in order to avoid administrative biases in student responses (McAlister, 2001).

After the surveys were completed by students and gathered by project staff, the surveys were sent to the Texas Department of Health, where they were forwarded to the Research Triangle Institute for data entry. The Research Triangle Institute, an independent organization founded by North Carolina State University, Duke University, and University of North Carolina at Chapel Hill, provides many research services (e.g., data entry) for various government, business, and university projects in the United States and abroad. After the data were entered by the Research Triangle Institute, the data were edited and checked for abnormal scores by project staff from the University of Texas-Houston (Texas Department of Health, 2001).

Measures

The proposed study used four independent and two dependent measures from the larger TTPI survey: positive and negative smoking expectancies, social norms (i.e., peer smoking), self-efficacy to abstain from smoking, intentions to smoke, and daily smoking. In addition, two grouping variables were used to assess school level (i.e., middle school or high school) and smoking status (i.e., smokers or non-smokers). Data for all eight measures were based on adolescents' self-reports. The following describes each of these measures. Following this, a section discussing the use of adolescents' perceptions for measuring major constructs is reviewed, followed by the plan of analysis that guided the

testing of the hypotheses.

Independent Variables

Positive smoking expectancies. Adolescents' perceptions of various positive consequences of smoking cigarettes were measured with seven items (see Table 1) such as "Do you think cigarette smoking helps people relax?" that they rated on a Likert type scale (i.e., 1 = definitely not to 4 = definitely yes) (McAlister, 2001). Scores for positive expectancies were computed by taking the mean of all seven items, with higher scores indicating higher positive expectancies on a Likert type scale. Cronbach's alpha (α), indicating the internal consistency of the scale, was equal to .84. As evidence for predictive validity, Bauman and Chenoworth (1984) found that scores on a similar measure of positive expectancies predicted increases in ACS over a one-year period in a sample of middle school students.

Negative smoking expectancies. A five-item measure, with questions such as, "Does tobacco kill more Texans than alcohol, AIDS, illegal drugs, auto accidents, suicides, homicides, and fires combined?", was used to assess negative expectancies (see Table 1). Possible responses ranged from 1 = definitely not to 4 = definitely yes on a Likert type scale with higher scores indicating more negative expectancies (McAlister, 2001). Scores for negative expectancies were computed by taking the mean of the five items, with higher scores indicating higher negative expectancies (α = .63). This type of negative smoking expectancy measure has demonstrated predictive validity for ACS over time in middle school students (Bauman & Chenoweth, 1984).

Peer smoking. Building on previous studies that have used peers as referent

groups when measuring social norms (e.g., Charlton & Blair, 1989; Hedeker et al., 1996), the present measure of social norms was assessed by computing the mean level of smoking for each grade at each school (McAlister, 2001). Evidence for the concurrent and predictive validity of this type of peer smoking measure has been demonstrated by Morgan and Grube (1989), and Chassin et al. (1991) who found that similar measures of the prevalence of peer smoking predicted ACS over time.

Self-efficacy to abstain from smoking. Four questions such as, "If your friends offer you a cigarette, are you able not to smoke?", and "If you feel nervous, are you able not to smoke?" were used to make up the self-efficacy to abstain from smoking measure (see Table 1). Self-efficacy scores were computed by taking the mean of the four items. Possible responses ranged from 1 = definitely not to 4 = definitely yes (McAlister, 2001). Higher scores indicated more self-efficacy (α = .89). Measures similar to this have demonstrated predictive validity for ACS over time (e.g., Baer et al., 1986).

Dependent Variables

Intentions to smoke. Adolescents' self-reported plans to smoke in the future were measured with four items such as "Do you think you will smoke a cigarette at any time during the next year?" (see Table 1). For this measure of intentions to smoke, responses ranged from 1 = definitely not to 4 = definitely yes (McAlister, 2001). Intention scores were computed by taking the mean of the four items, with higher scores indicating a greater intention to smoke (or less intention not to smoke). Measurement reliability (i.e., Cronbach's alpha) including participants from the entire sample equaled .88. Evidence for the predictive validity of this type of measure for ACS has been found over a one-year

period in high school students (Chassin, Presson, Sherman, Corty, & Olshavsky, 1984).

Smoking behavior. Smoking behavior was measured by one item, "During the past 30 days, on the days you smoked, how many cigarettes did you smoke per day?" (McAlister, 2001) (see Table 1). Responses ranged from 1 = zero to 7 = more than 20 cigarettes per day. This indicator of smoking behavior was recommended by the National Cancer Institute (1986), and has been shown to demonstrate convergent and discriminant validity with other indicators of smoking behavior (Stacy, Flay, Sussman, Brown, Santi, & Best, 1990; Stacy, Widaman, Hays, & DiMatteo, 1985).

Grouping Variables

School level. Adolescents were grouped into middle school and high school by categorizing their responses to the following item, "In what grade are you?". This 7-point item (i.e., Grade 6 to 12) was recoded into a dichotomous variable with 0 = Grade 6 to Grade 8 (i.e., middle school) and 1 = Grade 9 to Grade 12 (i.e., high school).[5]

Smoking status. Smokers and non-smokers were assessed by categorizing their responses to the following item, "During the past 30 days, on how many days did you smoke cigarettes?". Possible responses were: 1 = I did not smoke cigarettes during the past 30 days, 2 = 1 or 2 days, 3 = 3 to 5 days, 4 = 6 to 9 days, 5 = 10 to 19 days, 6 = 20 to 29 days, and 7 = All 30 days. This 7-point item was recoded into a dichotomous variable with the response of 1 being set equal to 0 (i.e., non-smokers) and the responses 2 to 7 being set equal to 1 (i.e., smokers).

Adolescent Perceptions of Major Constructs

The present study used self-report data obtained from adolescents participating in

the Texas Tobacco Prevention Initiative (McAlister, 2001). The following sections consider the costs and benefits of using this methodological approach.

Disadvantages

Problems with common method variance. Using a sole method such as self-reports (i.e., adolescent perceptions) to assess a construct is in contrast to Campbell and Fiske's (1959) recommendation that multiple independent methods are needed to appropriately assess a construct. More support is given towards the validity of a particular construct if multiple methods provide similar assessments of that construct. Moreover, using only one method to assess behavior does not allow for the assessment of shared method variance, which is systematic variance attributable to the characteristics of the method being employed. In the case of adolescents' perceptions of their own behavior, a certain amount of variance may be attributable to the estimation of a particular response within a particular range (e.g., definitely not to definitely yes) and not attributable to the trait being measured. In addition, without the use of multiple methods, shared method variance cannot be distinguished from trait variance, such as adolescents' tendencies to perceive themselves relatively positively or negatively (see Campbell & Fiske, 1959 for a discussion). Therefore, if significant relationships between constructs are found in this dissertation, it would not be known what portion of the variance is due to method variance. Based on these propositions, the use of adolescents' perceptions as the only method may arguably be a limitation.

Advantages

A more proximal association. Given that adolescent behavior is the focus and

outcome of interest in this dissertation, it seems appropriate to use adolescent rather than other people's (e.g., parents', teachers') self-reports of the measured constructs due to the more direct influence that adolescent perceptions may have on adolescent behavior. Parents' or teachers' perceptions of risk behaviors such as ACS may be particularly poor sources of information, given that parents or teachers may not have observed adolescents in smoking situations, and indeed, adolescents may actively hide their own smoking from important adults in their lives. Similarly, adolescents may not discuss any positive expectancies or other cognitions that they have about smoking with parents or teachers, due to fear of their disapproval, increased supervision, or punishment.

Support from symbolic interaction theory. The use of adolescent perceptions is also supported by one of the major tenets of symbolic interaction theory. Namely, symbolic interaction argued that people's perceptions have an influence on the social situations in which they interact (Thomas & Thomas, 1928). For example, Thomas (1923) suggested that the consequences people experience within a situation are based on how they define that situation. Elaborating on this idea, Burr, Leigh, Day, and Constantine (1979) discussed the importance of the definition of a situation. The definition of a situation emphasizes the variation of individuals' subjective interpretations for similar situations. That is, the same event may be perceived differently by individuals and, as a result, may have differing consequences.

Accordingly, advantages of using adolescents' perceptions over others' perceptions are that adolescent perceptions may: (1) be more indicative of how adolescents define and experience certain intra-personal (e.g., smoking expectancies,

self-efficacy) and inter-personal (e.g., interactions with particular referent groups in smoking-related situations) variables involved in smoking-related situations, and therefore, (2) give more accurate estimates of the effects of those situation-based variables on adolescent behavior. That is, according to Thomas, others' perceptions of adolescents' characteristics (e.g., expectancies) within smoking-related situations would not yield the most accurate estimates of how those characteristics might affect adolescent behavior.

In summary, while the ideas of Campbell and Fiske (1959) are recognized and acknowledged as possible disadvantages to using adolescent self-reports, this dissertation assumed, based on the ideas of symbolic interaction theory, that adolescents' perceptions of their own characteristics (i.e., the main constructs of this dissertation) produced the single most accurate and informed estimate of how those characteristics would be associated with adolescent behavior.

Principal Components Factor Analysis

Hypothesized factor structures. Tabachnick and Fidell (1983) described a series of types of factor analyses, based on Cattell (1966). The present principal component factor analysis (PCA) was Type R, which is used to assess the extent to which items inter-correlate across subjects. Specifically, this PCA was used to confirm the hypothesis that the 20 items from the data set of over 25,000 participants represent the hypothesized underlying structure of four empirically distinct factors. These four factors would represent: (1) positive smoking expectancies (seven items), (2) negative smoking expectancies (five items), (3) self-efficacy to abstain from smoking (four items), and (4)

intentions to smoke factor (four items). These 20 items had the same response formats. The hypothesis concerning the number of factors expected was evaluated by examining eigenvalues, which should be greater than one, and factor loadings, which should be greater than .5 (Cattell, 1966).

Results. As hypothesized, the results of the PCA revealed that four factors had eigenvalues greater than 1. Despite the exploratory nature of PCA, the great majority of the items (17 of 20 items) had factor loadings greater than .5 on their hypothesized factors. Three of the 20 items, though loading on their hypothesized factor, also had cross-loadings greater than .5 on an additional factor (see Table 1). One item, "Do you believe cigarette smoking helps people relax?", loaded at .51 on positive smoking expectancies as expected, but also loaded on the intentions to smoke factor (i.e., .54). In addition, two other items (i.e., "Does tobacco smoke smell and taste horrible?", and "If I smoke (or were to smoke) I would consider this stupid of me."), which loaded appropriately on the hypothesized negative expectancies factor at .42 and .45, also loaded at -.51 and -.53, on the intentions to smoke factor, respectively.

Tabachnick and Fidell (1983) noted that the results of PCA are not always clear, as in the present case. Following their recommendation, which is to consider loadings greater than .30 as eligible for interpretation, allows for the possibility of cross-loadings where single items load on more than one component. In such cases of unanticipated and undesired factorial complexity, the interpretation of the researcher based on theory and past empirical research is required (Tabachnick & Fidell, 1983). Based on the conceptual design of the measures and a consideration of the face validity of the three items with

cross-loadings, it was decided to retain these items as reflective of their hypothesized underlying constructs. Nonetheless, it is acknowledged that these cross-loadings represent an important measurement weakness. Specifically, such cross-construct correlations directly increase the size of relationships between these variables. This issue is discussed as a limitation in Chapter 5.

The final four factors were described as: (1) positive smoking expectancies, (2) negative smoking expectancies, (3) self-efficacy to abstain from smoking, and (4) intentions to smoke. Overall, these four factors accounted for 60.12% of the response variance with eigenvalues ranging from 6.92 to 1.25 and factor loadings on the hypothesized factors ranging from .85 to .42.

To test for the equivalence of the factor structure across subgroups, four additional PCAs were conducted separately for: (1) non-smokers ($\underline{n}$ = 23,105), (2) smokers ($\underline{n}$ = 7073), (3) middle school ($\underline{n}$ = 14,010), and (4) high school students ($\underline{n}$ = 16,168). The results were similar to the PCA conducted for the entire sample using the same criteria for factor loadings (see Table 1). The only differences were that for smokers the item, "Do you believe cigarette smoking helps people relax?", had a factor loading of .32 (in contrast to .51 for the full sample), and for non-smokers, two positive expectancy factors were identified, which contained the items hypothesized to load on the positive expectancies factor. The first factor emphasized physiological effects associated with smoking, while the second factor emphasized the social consequences of smoking.

To further explore these minor differences, two other PCAs were run separately for smokers and non-smokers in middle school ($\underline{ns}$ = 2342 and 11,668, respectively) and

in high school (ns = 4731 and 11,437, respectively). No differences in the underlying factor structure were found. Therefore, the results of the PCA of the total sample are accepted as appropriately representing the underlying factor structure of smokers and non-smokers and middle school and high school students.

Plan of Analysis

Descriptive statistics. Univariate statistics were presented by computing the number of smokers and non-smokers for each grade and the means, standard deviations (SDs), and skewness of the independent and dependent variables for smokers and non-smokers, separately, in middle school and high school. Additionally, the intercorrelations for the independent and dependent variables were computed and presented.

Additive and moderational hypotheses. Hypothesis 1a and 1c predicted additive, linear relationships of positive expectancies and peer smoking with intentions to smoke, and Hypothesis 2a predicted a moderational or interactive relationship of positive expectancies with peer smoking predicting intentions to smoke. To evaluate these three hypotheses (see Figures 2 and 3), hierarchical linear regression was used. Positive expectancies and peer smoking were entered on Step 1, followed by entering the interaction term of peer smoking with positive expectancies on Step 2. The criterion variable was smoking intentions. The same procedure was used to evaluate Hypotheses 1b and 2b, which predict additive main effects plus an interaction of negative expectancies and peer smoking predicting smoking intentions (see Figures 5 and 6). The additive main effects of self-efficacy and its interactional effects with positive and negative expectancies on intentions and ACS were also be evaluated with this procedure.

(i.e., Hypotheses 1d; 2c and 2d) (see Figures 2, 4, 5 and 7). For all analyses involving interactions, deviation scores were used to center scores around their means, thereby reducing multicollinearity. In other words, non-essential multicollinearity due to the scaling properties of the independent variables was reduced by subtracting their means from their scores (Aiken & West, 1991).

Interpretation of significant interactions for Hypotheses 2a to 2d was done according to a graphic description of the interactions (Aiken & West, 1991). First, regression equations were used to calculate the interactions, by multiplying high and low values of each independent variable with the unstandardized beta of that independent variable, summing these products, and adding the intercept. These high and low values for each independent variable were obtained by adding and subtracting one standard deviation from the mean. Second, four values representing high and low values of each independent variable were plotted on a graph to display the shape of each interaction. Lines representing high and low values of each independent variable were drawn to illustrate the direction and magnitude of the interaction.

School level and smoking status hypotheses. Hypotheses 3a to 4b were evaluated by adding several interaction terms to the additive and moderational analyses discussed above. The purpose of these analyses was to test for significant differences in the proposed additive and interactive relationships between smokers and non-smokers in middle school and high school. That is, if interactions were found to significantly predict intentions and ACS for the entire sample and subsequently for middle school and high school, then the proposed moderational relationships would be examined within four

groups: (1) middle school smokers, (2) middle school non-smokers, (3) high school smokers, and (4) high school non-smokers.

To elaborate, in addition to the additive effects of school level and smoking status, two-way interactions consisting of: (1) school level and expectancies, and (2) smoking status and expectancies, as well as three-way interactions consisting of: (1) school level, expectancies and peer smoking, (2) school level, expectancies, and self-efficacy, (3) smoking status, expectancies, and peer smoking, and (4) smoking status, expectancies, and self-efficacy were added to the proposed additive and moderational relationships for the entire sample. The two-way interactions were used to evaluate whether the proposed additive effects vary according to school level and smoking status. while the three way interactions were used to evaluate whether the proposed interactive effects vary according to school level and smoking status. To test these interactions using regression analyses, the two additive effects of school level and smoking status were entered on Step 1 with the other additive effects (Hypotheses 1a to 1d). Next, two-way interactions, which test school level and smoking status differences in the additive effects of positive and negative expectancies, along with the other proposed two-way interactions (Hypotheses 2a to 2d) were entered on Step 2. Lastly, the three-way interactions, which tested differences in the hypothesized interactive relationships, were entered on Step 3.

If two- and three-way interactions were found to significantly predict intentions and ACS for the entire sample, then the proposed additive and moderational relationships would be evaluated within middle and high school with the omission of all the

interactions involving school level. Subsequently, if the interactions involving smoking status were found to significantly predict intentions and ACS in middle school and high school, then the proposed moderational relationships would re-examined within the four groups mentioned above with the omission of all the interactions involving school level and smoking status. That is, the proposed additive and moderational relationships (i.e., Hypotheses 1a to 2d) would be examined in the following four groups: (1) middle school smokers, (2) middle school non-smokers, (3) high school smokers, and (4) high school non-smokers.

Conversely, if the two- and three-way interactions did not significantly predict intentions and ACS within the entire sample, then the analyses would be conducted again for the entire sample with the omission of all the two- and three-way interactions. The same procedure was used for examining the analyses within middle school and high school. Lastly, the two- and three-way interactions involving school level and smoking status with the other proposed constructs were examined in separate regressions due to the high correlations that probably exist between these two constructs. That is, previous research has found that the number of smokers typically increases substantially as adolescents progress through middle school and high school (O'Malley, Johnston, & Bachman, 1998).

CHAPTER 4

RESULTS

The results of the statistical analyses are presented in two sections. The first section presents the univariate statistics, as well as the intercorrelations for the independent and dependent variables. In the second section, the results of the analyses testing the hypotheses are presented, focusing first on the additive and moderational hypotheses, and then on the school level and smoking status hypotheses. A final section summarizes the findings of all the results.

Description of the Variables

This section presents the number of smokers and non-smokers for each grade, the means, standard deviations (SDs), and skewness of the independent and dependent variables for smokers and non-smokers, separately, in middle school and high school (see Table 2). It should be noted that the means for all the variables, except for the dependent variables, daily smoking (DSMK) (see below), are discussed in relation to their corresponding four point response scales with low, moderately low, moderately high, and high representing 1 = definitely not, 2 = probably not, 3 = probably yes, and 4 = definitely yes, respectively. Additionally, this section summarizes the intercorrelations among the independent and dependent variables.

The Number of Smokers and Non-smokers for the Independent Variables by Grade

Based on the information presented in Table 2, average percentages of smokers and non-smokers in each grade from 6 to12 were computed. Overall, there were more non-smokers than smokers reported (see Table 2). However, the percentage of reported

smokers was greater at the higher grade levels (i.e., approximately 11 percent, 16 percent, 23 percent, 27 percent, 28 percent, 31 percent, and 33 percent in Grade 6 through 12). Additionally, the average percentage of daily smoking across Grade 6 to Grade 12 for the present sample was higher than the national average (i.e., 24% versus 18%, respectively) as reported by the Center for Disease Control (2000). This indicated that this sample of Texan middle and high school students were at higher risk for nicotine addiction and related health problems compared to the national average. This issue is discussed more in the discussion section.

In Grade 6, the number of smokers and non-smokers for all variables ranged from 423 to 438 and 3567 to 3652, respectively, while in seventh grade there were 849 to 865 smokers and 4412 to 4483 non-smokers for all variables. Ns for eighth grade smokers reporting on all variables ranged from 1175 to 1208 and the Ns for non-smokers ranged from 3991 to 4085.

Smokers in ninth grade numbered from 1388 to 1426 on all the variables, and the number of non-smokers ranged from 3703 to 3761. In tenth grade, there were 1255 to 1281 smokers and 3213 to 3275 non-smokers reporting on all variables. Additionally, Ns for smokers in eleventh grade ranged from 1147 to 1173 for all variables, while the number of non-smokers in eleventh grade ranged from 2584 to 2640. Lastly, the number of smokers reporting on all variables in twelfth grade ranged from 1061 to 1082 and the number of non-smokers reporting on all variables ranged from 2131 to 2187 (see Table 2).

Independent Variables

Positive expectancies. Univariate descriptive statistics for positive expectancies indicated that non-smokers in Grades 6 to 12 on average reported low (i.e., 1 = definitely not) to moderately low (i.e., 2 = probably no) agreement with/endorsement of positive smoking expectancies with standard deviations ranging from .53 to.56 (see Table 2). These between-person differences appeared to be similar across grades. The skew of positive expectancies for non-smokers were positive for all grades, ranging from .8 to 1.59. Smokers' average levels of reported positive expectancies ranged from moderately low (i.e., 2 = probably not) to moderately high (i.e., 3 = probably yes) in Grades 6 to 12 with the majority of adolescent smokers reporting moderately low levels of positive expectancies. Similar levels of between-person variation were found among smokers' positive expectancies at each grade with SDs ranging from .60 to .81. Positive expectancies in smokers were minimally positively skewed with values ranging from .1 to .5.

Negative expectancies. On average, moderately low (i.e., 2 = probably not) to high (i.e., 4 = definitely yes) levels of negative expectancies were endorsed among adolescent non-smokers in Grades 6 to 12 with the majority of non-smokers endorsing moderately high levels of negative expectancies (see Table 2). Between-person variation in negative expectancies was found for non-smokers at each grade with SDs ranging from .49 to .54. Negative expectancies were negatively skewed for non-smokers at all grades with values ranging -.2 to -1.3. Smokers' average levels of negative expectancies at each grade ranged from moderately low (i.e., 2 = probably not) to moderately high (i.e., 3 =

probably yes) and were negatively skewed (i.e., -.57 to -.19). For negative expectancies reported by smokers, SDs ranged from .57 to .75 in Grades 6 to 12.

Peer smoking. In Grades 6 to 12, smokers and non-smokers in classrooms were on average exposed to relatively few peers who smoked with 76.2% of students in Grades 6 to 12 reporting that they had smoked "zero cigarettes" (i.e., a score of 1) daily during the past 30 days (see Table 2). Additionally, for the present measure of peer smoking, which was assessed by computing the mean level of smoking for each grade at each school, on average, 8.8% of adolescents reported smoking "less than one to 1 cigarette", 11.9% of adolescents reported smoking "2 to 10 cigarettes", 1.7% of adolescents reported smoking "11 to 20 cigarettes", and 1.4% of adolescents reported smoking "20 or more cigarettes" daily during the past 30 days. Standard deviations for smokers and non-smokers ranged from .12 to .24. Peer smoking was positively skewed for students in Grades 6, 7, 8, and 9, and negatively skewed for students in Grades 10, 11, and 12.

Self-efficacy to abstain from smoking. On average, non-smokers reported moderately high (3 = probably yes) to high (4 = definitely yes) levels of self-efficacy to abstain from smoking in Grades 6 to 12 with standard deviations ranging from .63 to .85 (see Table 2). Self-efficacy was negatively skewed, ranging in value from -3.00 to -1.3 at all occasions for non-smokers. The average levels of self-efficacy among smokers in Grades 6 to 12 were between moderately low (2 = probably no) and moderately high (i.e., 3 = probably yes). Additionally, self-efficacy was negatively skewed (i.e., -.40 to -.08) for smokers at all grades (SDs ranged from .63 to 1.02).

Dependent Variables

Intentions to smoke. Descriptive statistics indicated that average levels of intentions to smoke among non-smokers in Grade 6 to 12 ranged from low (i.e., 1 = definitely not) to moderately low (i.e., 2 = probably no) (see Table 2). For non-smokers, standard deviations ranged from .53 to .64 and positively skewed values were found ranging from 1.2 to 2.1. Smokers' average levels of intentions ranged from moderately low (i.e., 2 = probably no) to moderately high (i.e., 3 = probably yes) at all grades with negatively skewed values ranging from -.68 to -.94. Standard deviations ranged from .57 to .79 for intentions among smokers in Grades 6 to 12.

Daily smoking. By definition, all middle and high school non-smokers reported not smoking any cigarettes during the past 30 days. Accordingly, there was no variation or skewness for DSMK among non-smokers. For smokers in Grades 6 to 12, DSMK ranged from 3.46 to 4.24 (see Table 2). The cumulative percents indicate that 64% to 85% of smokers smoked 5 or less cigarettes per day (see Table 3). Between-person variation in DSMK was found at all occasions with standard deviations ranging from 1.25 to 1.75. DSMK was also positively skewed with values ranging from .22 to .84 (see Table 2).

Intercorrelations

Correlations among the variables for the entire sample, middle school and high school indicated significant positive correlations between positive expectancies, peer smoking, intentions, and DSMK, as well as between self-efficacy and negative expectancies. Conversely, self-efficacy and negative expectancies were significantly negatively correlated with positive expectancies, peer smoking, intentions and DSMK.

The directions of these correlations were consistent with the hypotheses.

In order to assess the possible threat of multicollinearity, or the amount of shared variance between the independent variables that could obscure clear interpretations of the results, the strength of their correlations was examined. Overall, relatively small correlations (rs ranged from .02 to .38, all $p < .001$, for 28 out of 30 total) were identified for the entire sample (see Table 4), as well as among middle school (see Table 5) and high school students (see Table 6). In Tables 4, 5, and 6, these correlations are found in the first four columns (across) and rows (down) from the top right hand corner. The two exceptions that were larger in size than the majority were the correlations between negative smoking expectancies and self-efficacy (rs = .45 for the entire sample and .42 for high school non-smokers, $p < .001$). Therefore, it could be argued that these two moderate correlations introduced the problem of multicollinearity for the present analyses of the hypotheses involving the two variables. That is, the amount of unique variance negative expectancies (Hypothesis 1b) and self-efficacy (Hypothesis 1d) accounted for in the dependent variables, respectively, may have been obscured by the shared variance between the two independent variables. However, these two correlations were only moderate in strength and therefore were not considered to have obscured the results of this dissertation.

Significant correlations (absolute values) among the independent variables and the hypothesized interactions, which can be found in the fifth through eighth columns and rows of Tables 4, 5, and 6, ranged from .02, $p < .05$ to .77, $p < .001$) were generally low. Fifty-eight the 80 correlations equaling less than .39, $p < .001$, for the entire sample,

middle school and high school. Significant correlations between the independent variables and the dependent variables, which are located in the last two columns of the lower quadrant and the last two rows in the upper quadrant of Tables 4, 5, and 6, ranged from .06 to .63, all $p < .001$, with the majority of ranging in strength from weak to moderate.

Summary of Descriptive Statistics

In general, mean levels for all the independent and dependent variables at all grades for both smokers and non-smokers seemed to indicate that adolescents in general were against smoking. That is, many adolescents reported low to moderately low positive expectancies, low exposure to peer smoking, relatively low intentions to smoke, no or very infrequent DSMK, as well as moderately high to high negative expectancies and self-efficacy to abstain from smoking, although these levels did vary. An important exception to these general anti-smoking responses for the entire sample was the observed intensity of smoking among the small percentage of smokers at each grade. That is, adolescents who smoked used on average 2 to 5 cigarettes per day.

It should be noted that the majority of the key constructs of this dissertation were somewhat skewed. As argued by Hammer and Landau (1981), skewness may produce error in the estimation of regression coefficients (e.g., over or under estimation). However, Cohen and Cohen (1983) argue that multiple regression is robust to the violation of the normal distribution assumption and typically yields correct estimates regarding the existence of linear relationships, even when the normal distribution assumption is violated. Accordingly, the obtained results are interpreted as valid (but

cautionary) estimates of the linear relationships proposed in this dissertation. Lastly, with two exceptions (see above), the intercorrelations among the independent variables were low suggesting that multicollinearity was not be a great concern for the interpretation of the analyses.

Additive, Moderational, School Level, and Smoking Status Hypotheses: Analyses and Results

Before testing the additive and moderational hypotheses among the four proposed groups of: (1) middle school smokers, (2) middle school non-smokers, (3) high school smokers, and (4) high school non-smokers, preliminary analyses examined whether it was important to test the primary hypotheses separately within these four groups. If no school level or smoking status difference were found as a result of conducting the preliminary analyses for the entire sample, then hypothesis testing would have been restricted to the entire sample. The next section describes the procedures used to conduct the preliminary analyses, as well as the results, followed by two sections discussing the results of: (1) the additive and moderational hypotheses and (2) the school level and smoking status hypotheses.

Preliminary Analyses

In order to assess whether the hypothesized additive and moderational relationships were different by school level (i.e., middle school vs. high school) and by smoking status (i.e., non-smoker vs. smoker), a preliminary series of two- and three-way school level and smoking status interactions were computed and subsequently used to predict intentions to smoke and DSMK in three different groups: (1) the entire sample,

(2) middle school, and (3) high school. The two-way interactions were used to evaluate whether the additive effects were similar by school level and by smoking status, and the three-way interactions were used to evaluate whether the interactive effects were similar by school level and smoking status. If significant differences by school level and smoking status were found for the entire sample, and then smoking status differences were subsequently found in middle school and high school, then exploring the nature (i.e., direction and strength) of these differences would be warranted. That is, these differences would be assessed and compared against the school level and smoking status hypotheses forwarded by this dissertation.

For the entire sample, four two-way interactions were used to predict intentions: (1 and 2) School level × Expectancies (i.e., two interactions with positive and negative expectancies), and (3 and 4) Smoking status × Expectancies. In addition there were eight three-way interactions: (1 and 2) School level × Expectancies × Peer smoking, (3 and 4) School level × Expectancies × Self-efficacy, (5 and 6) Smoking status × Expectancies × Peer smoking, and (7 and 8) Smoking status × Expectancies × Self-efficacy. The same two- and three-way interactions were also used to predict DSMK for the entire sample, with the exception of omitting the interactions involving peer smoking.

To test these interactions using regression analyses, the two additive effects of school level and smoking status were entered on Step 1 with the other additive effects (Hypotheses 1a to 1d). Next, two-way interactions, which tested school level and smoking status differences in the additive effects of positive and negative expectancies, along with the other proposed two-way interactions (Hypotheses 2a to 2d) were entered

on Step 2. Lastly, the three-way interactions, which tested differences in the hypothesized interactive relationships, were entered on Step 3. The same procedures were used to assess smoking status differences in middle school and high school, with the omission of the school level interactions.

It should be noted that the correlation between school level and smoking status was relatively weak ($r = .19$, $p < .001$) for the entire sample, indicating that school level and smoking status variables could have been used in the same regression analysis without obscuring the results due to shared variance. Nevertheless, analyses for the entire sample were conducted separately for school level and smoking status in order to be consistent with the literature, which has found a positive correlation between school level and smoking status (e.g., Oei & Burton, 1990; O'Malley et al., 1998). Additionally, the analyses were conducted in this manner in order to avoid the potential problem of multicollinearity, where school and smoking status differences in the prediction of intentions and DSMK may have been obscured by shared variance between school level and smoking status.

It also should be noted that these preliminary analyses are not discussed in detail, as they were not the main focus of this dissertation. As such, the summary of these results is in text form without the use of tables illustrating the ßs, R-squares, and p-values.

Preliminary findings. The findings revealed that 15 out of 16 two-way interactions involving school level and smoking status were significant predictors of intentions and DSMK among the three proposed groups: (1) the entire sample, (2)

middle school students, and (3) high school students. The exception was the two-way interaction of Smoking status × Positive expectancies predicting DSMK in high school students. Similarly, 20 out of 24 of the three-way interactions were significant in predicting intentions and DSMK. The exceptions were: (1) Smoking status × Negative expectancies × Self-efficacy; (2) Smoking status × Negative expectancies × Peer smoking; (3) School level × Negative expectancies × Peer smoking; and (4) School level × Positive expectancies × Self-efficacy, which failed to significantly predict intentions.

For all three groups, analyses revealed that the standardized beta coefficients for the two- and three-way interactions ranged from .01, $p < .05$, to .13, $p < .001$, with the many values ranging between .02 and .05 and approximately one quarter being greater than .05. The amount of unique variance explained ranged from less than one percent (i.e., .001) to approximately one percent (e.g., .01) for the analyses of all three groups. Based on the results of the preliminary analyses, it was concluded that the hypothesized additive and moderational relationships were different by school level and by smoking status. Hence, in order to explore the nature of these differences, Hypotheses 1a to 2d were tested and the results compared among four different groups: (1) middle school smokers and (2) middle school non-smokers, and (3) high school smokers and (4) high school non-smokers. In particular, the direction and strength of the standardized beta coefficients were compared among the four groups in accordance with the proposed school level and smoking status hypotheses (Hypotheses 3a to 4b). The results of the additive and moderational hypotheses are described next, followed by discussing the results of the school level and smoking status hypotheses.

Additive and Moderational Hypotheses: Results

A series of six multiple regression analyses tested the additive and moderational hypotheses as described in Chapter 2. Analyses were conducted for smokers and non-smokers in middle and high school separately. First, among smokers, four regression equations were conducted predicting intentions to smoke and DSMK among middle and high school students. Next, among non-smokers, two regressions were conducted predicting smoking intentions among middle and high school students.

In the four analyses predicting smoking intentions, positive and negative smoking expectancies, peer smoking, and self-efficacy were entered as predictors on a first step (testing the additive hypotheses 1a to 1d). The interactions of positive and negative smoking expectancies with peer smoking and self-efficacy were added on a second step (testing the moderational hypotheses 2a to 2d). The same predictors were added in two steps predicting DSMK (testing the additive hypotheses 1a, 1b, and 1d on Step 1 and the moderational hypotheses 2c and 2d on Step 2).

Before describing the results for each hypothesis in turn, a discussion of the total amount of variance accounted for (i.e., R^2 values) by these equations is presented. For each hypothesis, all predicted relationships (i.e., significant and non-significant findings) are discussed for smokers and non-smokers in middle school and high school. Comparisons of the predicted relationships among these groups are discussed in the subsequent sections that present the results of the school level and smoking status hypotheses.

Variance accounted for: Additive and moderational models predicting intentions and daily smoking. The total amount of variance accounted for in intentions by all the additive effects (i.e., Step 1 $\underline{R}^2$s) ranged from .18 to .32, all $\underline{p} < .001$, among smokers and non-smokers in middle school and high school (see Table 7). Step 2 $\underline{R}^2$s for the interactional models ranged from .007 to .02, all $\underline{p} < .001$, with three of four $\underline{R}^2$s equaling at least one percent of the total variance (see Table 7). This is arguably noteworthy for results based on a non-experimental design (this point is developed more in Chapter 5, Discussion) (McClelland & Judd, 1993).

Step 1 $\underline{R}^2$s for the prediction of DSMK among smokers were .15 in middle school and in high school, both $\underline{p} < .001$ (see Table 8). Lastly, the Step 2 $\underline{R}^2$ for the interactional model predicting DSMK in middle school was .004, $\underline{p} < .01$. In high school, the interactional model did not predict any additional variance beyond the additive model, Step 2 $\underline{R}^2 = .000$, ns.

H1a. Adolescents with more positive smoking expectancies will report higher levels of intentions to smoke and daily smoking. The results for Step 1 of the multiple regression analyses predicting intentions and DSMK showed that positive smoking expectancies were a significant positive predictor among smokers and non-smokers in middle and high school, independent of the other predictors (see Tables 7 and 8). Smokers and non-smokers in middle and high school who reported higher levels of positive expectancies reported higher levels of intentions and DSMK. The standardized beta coefficients for these relationships ranged from .34 to .48 for intentions and were

equal to .28 and .19 predicting DSMK in middle school and high school, respectively, all $p < .001$.

H1b. Adolescents with more negative smoking expectancies will report lower levels of intentions to smoke and daily smoking. Independent significant negative effects of negative expectancies on intentions (see Table 7) and DSMK (see Table 8) were obtained in Step 1 of the multiple regression analysis. Adolescents who reported higher levels of negative expectancies were less likely to intend to smoke (βs ranged from -.20 to -.16 in middle school and high school, all $p < .001$) and engage in DSMK (βs = -.06 in middle and -.07 in high school, both $p < .001$).

H1c. Adolescents who are exposed to higher levels of peer smoking in their schools will report higher levels of intentions to smoke. Hypothesis 1c was also supported by the data with the exception of among high school non-smokers (Step 1 β = .02, ns). For smokers in middle school and non-smokers in middle and high school, peer smoking positively and uniquely predicted variance in intentions (Step 1 βs = .09 to .10, all $p < .001$), (see Table 7). That is, adolescents who were exposed to higher levels of peer smoking reported higher levels of intentions to smoke concurrently.

H1d. Adolescents who report higher levels of self-efficacy will report lower levels of intentions to smoke and daily smoking. Support was found for a negative relationship of self-efficacy with intentions (see Table 7) above and beyond the other predictors. Among smokers and non-smokers in middle school and high school, Step 1 standardized beta coefficients ranged from -.11 to -.28, all $p < .001$. Self-efficacy did not

predict unique variance in DSMK among middle school smokers but did among high school smokers (Step 1 β = -.28, $p < .001$) (see Table 8).

H2a. Positive smoking expectancies and peer smoking will interact such that peer smoking will be more predictive of intentions to smoke among adolescents reporting higher positive expectancies. Among middle school non-smokers and high school smokers only, there was a significant interaction of positive expectancies with peer smoking predicting intentions to smoke (Step 2 βs = .04 and -.09, $p < .001$, respectively) (see Table 7). This interaction was independent of the main effects and the other interactions in the equation. Examination of the shape of this interaction showed that its direction was different in the two groups. Among middle school non-smokers, peer smoking was more predictive of intentions to smoke among those with higher positive expectancies than among those with less positive expectancies, as hypothesized (see Figure 8). Contrary to hypothesis, among high school smokers, the effect of peer smoking on intentions was stronger among adolescents with lower positive expectancies than among those with more positive expectancies (see Figure 9). The interaction of positive expectancies with peer smoking was not significant among middle school smokers or high school non-smokers.

H2b. Negative smoking expectancies and peer smoking will interact such that peer smoking will be less predictive of intentions to smoke among adolescents reporting higher negative expectancies. Hypothesis 2b was generally not supported. That is, on Step 2 a significant interaction of peer smoking with negative smoking expectancies uniquely predicted intentions among middle school smokers only (β = .06, $p < .001$) (see

Table 7), but in a direction contrary to that which was predicted. A plot of this interaction showed that the relationship of peer smoking with smoking intentions was stronger among adolescents with higher negative expectancies (see Figure 10). Another interaction was found to be marginally significant in predicting unique variance in intentions among high school smokers (β = -.04, p =.06) (see Table 7), where the effect of peer smoking was weaker among adolescents with higher negative expectancies, as hypothesized (see Figure 11). Significant interactions of negative expectancies and peer smoking were not observed among non-smokers in middle or high school.

H2c. Positive smoking expectancies and self-efficacy and will interact such that self-efficacy will be less predictive of intentions to smoke and daily smoking among adolescents reporting higher positive smoking expectancies. No support was found for Hypothesis 2c. Among middle and high school non-smokers, respectively, the Step 2 standardized betas coefficients predicting intentions by the interaction of positive expectancies and self-efficacy were -.10 and -.07, both $p < .001$ (see Table 7), but in a direction opposite to hypothesis. The directions of these interactions were such that the effect of self-efficacy on intentions was stronger among adolescents with higher positive expectancies (see Figures 12 and 13). Among middle and high school smokers, significant interactions predicting intentions and DSMK were not found.

H2d. Negative smoking expectancies and self-efficacy will interact such that self-efficacy will be more predictive of intentions to smoke and daily smoking among adolescents reporting higher negative smoking expectancies. Support was found for significant interactions of self-efficacy with negative expectancies predicting intentions

to smoke for middle school and high school smokers and non-smokers (see Table 7). The relationship of self-efficacy with intentions was stronger among adolescents reporting higher negative expectancies, above and beyond the associations of the other predictors (see Figures 14 to 17). That is, directional support for Hypothesis 2d was found at all occasions for the prediction of intentions (Step 2 ßs ranged from -.08 to -.15, all $p < .001$).[6]

A significant interaction predicting DSMK was also identified in middle school smokers (see Figure 18), but in the opposite direction to hypothesis. That is, the effect of self-efficacy on DSMK was weaker among adolescents with higher negative expectancies (Step 2 $ß = .09$, $p < .01$) (see Table 8). No support was found for a significant interaction of self-efficacy with negative expectancies predicting DSMK among high school smokers.

School Level and Smoking Status Hypotheses

Comparisons of the additive and moderational hypotheses by school level and smoking status. To test the school level and smoking status hypotheses, significant differences in the strength of beta coefficients were assessed among the four groups of smokers and non-smokers in middle and high school. These differences were tested in order to assess whether: (1) the main and moderating effects of positive smoking expectancies on adolescents' intentions to smoke and DSMK were stronger in middle school than in high school, (2) the main and moderating effects of negative smoking expectancies on adolescents' intentions to smoke and DSMK were stronger in high school than in middle school (Hypotheses 3a and 3b, respectively), and (3) the main and

moderating effects of positive and negative smoking expectancies differed significantly in strength on adolescents' intentions to smoke and DSMK between smokers and non-smokers in middle and high school (Hypotheses 4a and 4b).

Significant differences between two standardized partial regression coefficients were tested in three steps as described by Gujarati (1995), using the formula $\underline{t} = \beta_1 - \beta_2 / SE_{\beta 1}$. β_1 and β_2 were defined as the two standardized beta coefficients to be compared, and $SE_{\beta 1}$ was defined as the standard error of the first standardized beta coefficient. The first step was to subtract the value of β_2 from the value of β_1. Second, the difference was divided by $SE_{\beta 1}$, resulting in a computed $\underline{t}$ value. In the third step, the computed $\underline{t}$ value was compared to the critical $\underline{t}$ value at a chosen significance level, in this case 3.09 for $\underline{p} < .001$ and 1.96 for $\underline{p} < .05$. For all school level and smoking status comparisons, if the computed $\underline{t}$ value exceeded the critical $\underline{t}$ value, then the two beta coefficients being compared were posited to be significantly different in strength. For each hypothesis below, significant and non-significant differences are discussed.

It should be noted that for the findings of Hypotheses 3a and 3b below, the results are presented in the following order: (1) school level differences in the strength of the additive effects on intentions for non-smokers, (2) school level differences in the strength of the additive effects on intentions and DSMK for smokers, (3) school level differences in the strength of the interactive effects on intentions for non-smokers, and (4) school level differences in the strength of the interactive effects on intentions and DSMK for smokers. For the findings of Hypotheses 4a and 4b below, the results are presented by discussing smoking status differences in the additive and interactive effects on intentions

in middle school, and then in high school. Additionally, t values are used in text below to indicate significant differences in standardized beta coefficients that were compared, and the reader is referred to Tables 7 and 8 for a visual comparison of the indicated significant differences.

H3a. The main and moderating effects of positive smoking expectancies on adolescents' intentions to smoke and daily smoking will be stronger in middle school than in high school. As hypothesized, all of the additive effects of positive expectancies predicting intentions and DSMK were significantly stronger in middle school than in high school for both non-smokers and smokers (see Tables 7 and 8). Computed t values comparing the strength of the relationships in middle vs. high school ranged from 3.4 to 7.1, $p < .001$, with degrees of freedom all exceeding 2200. Similarly, the moderating effect of positive expectancies on the relationship between peer smoking and intentions, as well as the relationship between self-efficacy and intentions was significantly stronger in middle school than in high school among non-smokers ($t(11,585) = 3.4$, $p < .001$ and $t(11,588) = 3.7$, $p < .001$, respectively) (see Tables 7 and 8). Conversely, the interactive effect of positive expectancies on the relationship between peer smoking and intentions among smokers was significantly weaker in middle school than in high school ($t(2239) = 2.4$, $p < .05$) (see Table 7). No school level differences in the strength of standardized beta coefficients were found among smokers for the interactions of positive expectancies with self-efficacy predicting intentions or DSMK (see Table 8).

H3b. The main and moderating effects of negative smoking expectancies on adolescents' intentions to smoke and daily smoking will be stronger in high school than in

middle school. Limited support was found for Hypothesis 3b. Among non-smokers, the additive effect of negative expectancies on intentions was marginally significantly stronger in high school than in middle school, with the one tailed t (11,588) = 1.7, $p <$ .05, as hypothesized (see Table 7). Among smokers, there were no school level differences in the strength of the additive effects of negative expectancies predicting intentions or DSMK (see Tables 7 and 8). Conversely, support was found for the hypothesis that the moderating effect of negative expectancies on the relationship between self-efficacy and intentions would be stronger in high school than in middle school for non-smokers and smokers with t (11,585) = 2.2, $p < .05$ and t (2239) = 6.8, $p <$ .001, respectively (see Table 7). The opposite was found for the prediction DSMK among smokers, where the moderating effect of negative expectancies on the relationship between self-efficacy and DSMK was weaker in high school than in middle school with t (2239) = 2.0, $p < .05$ (see Table 8). In addition, no school level differences in the moderating effect of negative expectancies on the relationship between peer smoking and intentions were found for smokers (see Table 7).

H4a. The main and moderating effects of positive smoking expectancies on adolescents' intentions to smoke will significantly differ in strength between smokers and non-smokers in both middle and high school. In support of Hypothesis 4a, the predictive strength of positive expectancies on intentions was significantly stronger for non-smokers than for smokers in middle school with t (11,588) = 4.3, $p < .001$. No smoking status differences in the predictive strength of the interactions of positive expectancies with peer smoking and self-efficacy were found in middle school. For high school, the association

of positive expectancies with intentions was significantly stronger for non-smokers than for smokers with t (11,588) = 5.1, $p < .001$. Correspondingly, the moderating effect of positive expectancies on the relationship between self-efficacy and intentions was stronger among non-smokers than for smokers in high school with t (11,585) = 6.3, $p < .001$. The opposite was found for the moderating effect of positive expectancies on the relationship between peer smoking and intentions in high school, where the effect was weaker among non-smokers with t (11,588) = 3.5, $p < .001$.

H4b. The main and moderating effects of negative smoking expectancies on adolescents' intentions to smoke will significantly differ in strength between smokers and non-smokers in both middle and high school. Smoking status differences in the additive effects of negative expectancies on intentions were not found in middle school. Similarly, smoking status differences were not found for the predictive strength of negative expectancies as a moderator of the relationship between self-efficacy and intentions in middle school. However, as hypothesized, the interactive effect of negative expectancies on the relationship between peer smoking and intentions was weaker for non-smokers than for smokers in middle school with t (11,588) = 2.3, $p < .05$. Similarly, significant differences in the additive effects of negative expectancies on intentions were found in high school. Similar to positive expectancies, the latter relationship was stronger for non-smokers than smokers with t (11,588) = 3.9, $p < .001$. In contrast, the interactive effect of negative expectancies on the relationship between peer smoking and intentions was marginally significantly weaker for non-smokers than smokers high school with one-tailed t (11,588) = 1.7, $p < .05$. Smoking status differences were not found for

the predictive strength of negative expectancies as a moderator of the relationship between self-efficacy and intentions in high school.

Summary of the Results for the Additive, Moderational, School Level and Smoking Status Hypotheses

The following summarizes the results in two sections with the first section presenting the results of the additive and moderational hypotheses, and the second presenting the results of the school level and smoking status hypotheses.

Results of the additive and moderational hypotheses. Support was found for the additive hypotheses. That is, for smokers and non-smokers in middle school and high school: (1) higher levels of positive smoking expectancies and peer smoking were associated with higher levels of intentions to smoke and DSMK, and (2) higher levels of negative expectancies and self-efficacy were associated with lower levels of intentions and DSMK. Modest support was found for the interactive hypotheses predicting intentions with 5 of 16 hypothesized interactions evidencing significant relationships in the predicted directions, in addition to one marginally significant interaction . For these six interactions, (1) the effect of peer smoking on intentions was stronger among middle school non-smokers reporting higher levels of positive expectancies; (2) the effect of peer smoking on intentions was weaker among high school smokers reporting higher levels of negative expectancies; and (3 to 6) the effect of self-efficacy on intentions to smoke was stronger among smokers and non-smokers in middle and high school reporting higher levels of negative expectancies. No support was found for the moderational hypotheses

predicting DSMK as only one of four interactions was found to be significant and opposite of the hypothesized direction.

Results of the school level and smoking status hypotheses. School level differences in the strength of relationships were observed for many of the predictors. As hypothesized, the additive effects of positive expectancies on intentions and DSMK were significantly stronger in middle school than in high school for smokers and non-smokers. Support for the school level hypotheses regarding the moderating effects of positive expectancies on the relationships of peer smoking and self-efficacy with intentions was found for non-smokers, but not smokers, where the moderating effect was significantly stronger in middle school than in high school. Additionally, school level differences in the strength of the moderating effects of positive expectancies on DSMK were not found for any of the hypothesized interactions.

School level differences in the additive strength of negative expectancies on intentions were not generally supported. In particular, marginal school level differences in the strength of the additive effects of negative expectancies on intentions were found only for non-smokers and not smokers. Similarly, no school level differences were identified for the moderating effect of negative expectancies on the relationships of peer smoking with intentions or DSMK, or for the moderating effect of negative expectancies on the relationship between self-efficacy and DSMK. On the contrary, support for school level differences was found for the interactive effect of negative expectancies with self-efficacy on intentions among smokers and non-smokers.

Many of the predictors also differed in strength according to smoking status. The additive effects of positive expectancies on intentions were significantly stronger for non-smokers than for smokers in middle and high school. Similarly, the moderating effects of positive expectancies on the relationships of peer smoking and self-efficacy with intentions were significantly stronger for non-smokers than for smokers. The latter differences were not found in middle school. Modest support for smoking status differences in the predictive strength of negative expectancies on intentions was found and in a similar direction as positive expectancies. Here, the additive effect of negative expectancies on intentions was stronger for non-smokers than for smokers only in high school. Such differences were not found in middle school. In both middle and high school, the moderating effect of negative expectancies on the relationship between peer smoking and intentions was stronger for smokers than for non-smokers. No smoking status differences were found for the interaction involving negative expectancies and self-efficacy in middle or high school.

CHAPTER 5

DISCUSSION

This chapter consists of five sections. First, the purpose and hypotheses of this dissertation are reviewed, followed by a section that summarizes the results. The third section discusses the implications the present results have regarding the role of expectancies within TPB and social cognitive theory, and previous conceptualizations of risk and protective interactive effects (Jessor, Bos, Vanderryn, Costa, & Turbin, 1995; Rutter, 1987). The fourth section discusses implications of the results for the prevention of adolescent tobacco use, and a final section considers the strengths and limitations of the method and analyses as well as directions for future research.

Purpose and Hypotheses

The purpose of this dissertation was to test an adapted and extended model of the theory of planned behavior (TPB-E) (Ajzen, 1991). Specifically, based on the theoretical ideas of Marlatt (1985), positive and negative smoking expectancies were hypothesized to moderate the relationships of peer smoking and self-efficacy with intentions, and for self-efficacy only, smoking behavior (see Figures 2 and 5). In addition, school level and smoking status differences in the hypothesized relationships were explored. It was expected that the hypothesized interactions would provide additional explanatory power to the traditional additive model of TPB. Additionally, the analyses were expected to contribute insight into possible school level and smoking status differences in the hypothesized relationships.

Summary of Findings

Consistent support was found for the additive hypotheses (Hypotheses 1a to 1d). Moderate support was found for the interactive hypotheses predicting intentions to smoke (Hypotheses 2a to 2d). The interactive hypotheses predicting DSMK were not supported. Lastly, the school level and smoking status hypotheses (Hypotheses 3a to 4b) were moderately supported among the four different groups. All of these results, including discussions of the preliminary principal components analyses and preliminary multiple regression analyses, are presented next.

Principal Components Factor Analysis

In order to determine the underlying factor structure of the data, a principal components factor analysis (PCA) was conducted. Results indicated that the four empirically distinct factors posited by TPB were generally very well represented by the present measures in the Texas Tobacco Prevention Initiative sample of over 25,000 adolescents. These four constructs were: (1) positive smoking expectancies, (2) negative smoking expectancies, (3) self-efficacy, and (4) intentions to smoke. The two exceptions were that one item cross loaded between positive expectancies factor and the intention to smoke factor, and two other items loaded on both the intentions to smoke factor and the negative expectancies factors. These results created a potential lack of discriminant validity between intentions and negative expectancies. However, based on considerations of the conceptual definitions of the constructs, face validity, and the acceptable size of the loadings on the hypothesized factors (see Chapter 3, page 60), these items were cautiously retained as indicators of their hypothesized underlying constructs. This

potential measurement problem is discussed later in the strength and limitations section (page 115).

Preliminary Multiple Regression Analyses

Preliminary regression analyses were conducted in order to determine if the proposed additive and interactive relationships were different by school level and by smoking status. Results indicated that many of the hypothesized relationships were different by school level and by smoking status. Therefore, to explore the nature of these differences, Hypotheses 1a to 2d were tested separately within middle school and high school non-smokers and smokers. A summary of the results for each of these groups is presented next, followed by a section comparing the results across groups in accordance with the school level and smoking status hypotheses (Hypotheses 3a to 4b).

Additive Effects of the Hypothesized Relationships

In support of TPB-E, positive and negative expectancies, peer smoking, and self-efficacy were found to predict smoking intentions among all four groups (middle school smokers, middle school non-smokers, high school smokers, and high school non-smokers). In addition, positive expectancies, negative expectancies and self-efficacy predicted DSMK among all groups (see Figure 19). Interestingly, positive smoking expectancies accounted for more unique variance in intentions and DSMK than all the other predictors (to be discussed later). Consistent with findings from previous studies (Brandon & Baker, 1991; Chassin et al., 1991; DeVries et al., 1990; Eiser et al., 1989; Garcia et al., 1990; Grube et al., 1986; Morgan & Grube, 1989), adolescents who reported higher levels of positive expectancies and higher exposure to peer smoking

reported higher levels of intentions and, for just for positive expectancies, DSMK. In addition, adolescents who reported higher levels of negative expectancies and self-efficacy reported lower levels of intentions and DSMK. The two exceptions were that peer smoking only marginally significantly predicted intentions among high school non-smokers and self-efficacy failed to predict DSMK in middle school smokers.

Non-significant associations of peer smoking with intentions to smoke and self-efficacy with daily smoking. The lack of a significant association of peer smoking with intentions to smoke among high school non-smokers may have been due to the type of measure that was chosen. The present measure was developed by computing the mean level of smoking for each grade at each school (McAlister, 2001). Prior measures of peer smoking based on adolescent perceptions, though frequently used in the literature (e.g., Chassin et al., 1991; Eiser et al., 1989; Grube et al., 1986), may yield spurious associations due to selection effects and inaccurate adolescent estimates of peer behavior. That is, adolescents tend to select peers who share similar substance use preferences and behaviors (Cohen, 1977; Kandel, 1978, 1996). Moreover, adolescents may overestimate similarities between their peers' behaviors and their own (Baer & Carney, 1986). Therefore, a measure of peer smoking that assessed peer smoking across grade and school was used in order to provide a more direct and conservative test of the peer exposure hypothesis.

The failure of self-efficacy to predict DSMK in middle school may be explained, in part, by TPB (Ajzen, 1991). TPB posited that self-efficacy is the only variable (other than intentions) that predicts behavior directly, however positive and negative

expectancies also predicted DSMK in middle school. Hence, it is possible that positive and negative expectancies may have been more important than self-efficacy in predicting DSMK in middle school. It should be noted that the predictive effect of intentions on DSMK was not controlled as posited by TPB. That is, the present measure of DSMK assessed past smoking behavior and the intentions to smoke factor assessed future intentions to smoke, thereby making it inappropriate to predict past DSMK based on future intentions. Therefore, this dissertation was unable to adequately assess the validity of the above argument as one possible explanation for why self-efficacy did not predict DSMK in middle school.

Hypotheses about Interactions Predicting Intentions to Smoke and Smoking Behavior

Modest support was found for the interactive relationships of TPB-E predicting intentions, but not DSMK, among middle and high school smokers and non-smokers (see Figures 20 and 21). The interaction of negative expectancies with self-efficacy significantly predicted intentions in all four tests. For the prediction of DSMK, positive and negative expectancies did not moderate the relationship between self-efficacy and DSMK, as only one of four interactions was significant and was opposite to the hypothesized direction. Possible reasons why TPB-E was more successful in predicting intentions than actual smoking behavior are discussed in the Theoretical Implications section of this chapter. School level and smoking status differences across the four tested groups are discussed next.

School Level Differences in the Hypothesized Expectancy Relationships

Positive expectancies were significantly stronger predictors of intentions and DSMK in middle school than in high school for smokers and non-smokers, consistently confirming the additive part of Hypothesis 3a (see page 48). Only marginal support was found for the additive part of Hypothesis 3b, which proposed that the additive predictive strength of negative expectancies on intentions and DSMK would be stronger in high school than in middle school. Lastly, moderate support was found for the school level hypotheses regarding the interactive effects of positive and negative expectancies (Hypotheses 3a and 3b, respectively) predicting intentions (not DSMK). That is, the interactive effect involving positive expectancies on intentions was stronger in middle school than high school and the interactive effects involving negative expectancies predicting intentions were stronger in high school than in middle school.

Smoking Status Differences in the Hypothesized Expectancy Relationships

Moderate support was found for the smoking status hypotheses. As hypothesized, the additive effects of positive expectancies (Hypothesis 4a) were stronger predictors of intentions for non-smokers than for smokers in both middle and high school (see rationale in Chapter 2, page 50). Negative expectancies were significantly stronger predictors of intentions for non-smokers than for smokers in high school only (Hypothesis 4b). With respect to smoking status differences in the interactions, the interactive effects of positive expectancies and negative expectancies (Hypotheses 4a and 4b, respectively) with peer smoking were stronger for smokers than non-smokers in high school. In middle school, only the interaction of negative expectancies and peer smoking predicted intentions in the same hypothesized direction. Finally, the interaction of

positive expectancies with self-efficacy predicting intentions (Hypothesis 4a) was greater for non-smokers than for smokers in high school only. The theoretical implications of these smoking status differences, as well as the other results already presented in this chapter, are presented next.

Theoretical Implications

Theory of Planned Behavior

The results of this dissertation served to bolster the utility of TPB-E for the prediction of intentions to smoke, but not DSMK. More specifically, the additive effects proposed in TPB-E consistently predicted intentions to smoke and DSMK. In addition, based on the ideas of Marlatt (1985) (see Chapter 2, page 28), these findings supported a key hypothesis of this dissertation: TPB-E, which included positive and negative expectancies as moderators of the relationships posited in TPB, would predict more variance in smoking intentions than the additive effects posited in TPB (Ajzen, 1991).

Additive effects predicting intentions to smoke and daily smoking. In general, the results regarding the additive effects of the constructs in TPB-E confirm the additive assumptions of TPB (Ajzen, 1991). Specifically, in accordance with TPB, positive expectancies, negative expectancies, peer smoking, and self-efficacy predict intentions to smoke, and just for self-efficacy, DSMK (see Figure 19). Additional results for the present model of TPB-E demonstrated that positive and negative expectancies predicted DSMK in addition to self-efficacy. TPB (Ajzen, 1991) did not posit that positive and negative expectancies would predict behavior directly. Hence, it could be argued that the additive effects within TPB-E added explanatory power to TPB for the prediction of

DSMK. Nevertheless, this argument could not be properly evaluated because the present study did not control for the effect of intention to smoke on DSMK (see page 94).

Other results regarding the additive effects demonstrated that positive smoking expectancies accounted for more unique variance in intentions to smoke and DSMK than any other predictor, with the exception of self-efficacy among high school smokers. TPB (Ajzen, 1991) did not posit any of its constructs to be more important in the prediction of intentions to smoke and DSMK, with the exception of asserting that only self-efficacy and intentions predicted DSMK directly. Therefore, the results of this dissertation suggest that positive expectancies played a more important role in the prediction of intentions and DSMK than posited by TPB. As such, perhaps future research should give more prominence to positive expectancies than the other predictors within TPB-E for the prediction of intentions and behavior. This idea is discussed in more detail in the Directions for Future Research section of this chapter. Next, the different ways in which the interactive effects of TPB-E predicted intentions to smoke and DSMK are discussed.

Interactive effects predicting intentions. The moderate support found for the interactive hypotheses predicting intentions to smoke demonstrated the utility of TPB-E (see Figures 20 and 21). That is, this support affirmed a main argument of this dissertation: Interactive effects added explanatory power to intentions to smoke above and beyond the additive effects posited in TPB. However, the interactive effects were only moderately, and not consistently, supported across hypotheses. Therefore, an argument could be made that the validity of the identified interactive effects should be questioned. That is, it could be argued that the identified interactive effects were a

product of Type 1 error, especially given how small the effect sizes were (i.e., small $\underline{R}^2$ change and had little effect on changing the Step 1 regression estimates of the additive effects). Accordingly, it could be stated that the interactive results would not be replicable in other samples, and therefore did not add any additional explanatory power to TPB in the present study.

However, there are at least two reasons why the present interactions are noteworthy. First, despite the small effect sizes, the directions of three types of interactions (i.e., positive expectancies and negative expectancies with peer smoking, and negative expectancies with self-efficacy) were consistent with the hypotheses suggested by TPB-E. Moreover, the interaction of negative expectancies with self-efficacy demonstrated consistent support for Hypothesis 2d (see Figures 14, 15, 16, and 17). Additionally, all the significant interactions, including those that did not support the hypotheses, revealed protective or risk effects that were consistent with Rutter's (1987) and Jessor and colleagues' (1995) conceptualizations. These ideas are discussed in more detail later beginning on page 106). There was only one interaction, positive expectancies with peer smoking among high school smokers, that did not fit this description. Briefly stated, with one exception, the effect of a risk factor (e.g., peer smoking) on intentions to smoke was either intensified by a moderating risk factor (e.g., positive expectancies) (see Figure 8), or weakened by a protective factor (e.g., negative expectancies) (see Figure 11). Moreover, the effect of a protective factor (e.g., self-efficacy) on intentions to smoke was either amplified by a moderating protective factor (e.g., negative expectancies) (see Figure 14) or weakened by a moderating risk factor

(e.g., peer smoking) (see Figure 22).

This consistent directional support of interactive risk and protective effects bolstered the idea that the observed interactions, although small in effect size, were reliable and not a product of Type 1 error. If the interactions were found solely by chance or due to the high degree of power, the directions of the interactions would not have been so consistent with the above descriptions of risk and protective interactions (Jessor et al., 1995; Rutter, 1987).

A second argument in favor of interpreting the present interactions is that interactions are extremely hard to detect in non-experimental designs with correlated main effects, in comparison to within experimental designs with orthogonal factors (McClelland & Judd, 1993). In experimental designs, the treatment and control groups are identical except for the manipulation of the independent variables (e.g., exposure to a curriculum (no, yes) and pre-tested vs. not). With random assignment, there are equal numbers of subjects in all cells, which maximizes the chances of finding a significant interaction, should one actually exist. In contrast, non-experimental designs must work with the joint distribution of predictors found in the data. With naturally correlated predictors (in contrast to orthogonal factors), there may be relatively few individuals who are high on one predictor (e.g., negative expectancies) and low on another (self-efficacy to abstain). Hence, in comparison to experimental designs, McClelland and Judd (1993) suggested that interactions are difficult to identify in non-experimental studies and typically account for only 1% to 3% of the total variance. Therefore, the statistical

interactions found in the present study are arguably noteworthy, as they accounted for approximately 1% to 2% of the variance, after controlling for the main effects.

Interactive effects predicting daily smoking. In general, the interactive effects posited in TPB-E did not predict DSMK. This result appears to support TPB (Ajzen, 1991) which asserts that self-efficacy and intentions are the only direct predictors of behavior. From this perspective, it could be argued that interactions involving self-efficacy, as well as interactions in general, should not predict DSMK. (The reader is reminded that hypotheses involving DSMK were only tested among smokers; this variable reflects variation in the intensity of smoking among smokers.) As noted previously (page 94), a more appropriate way of examining whether the interactions proposed in this dissertation predicted DSMK would have been to control for the predictive effect of intentions to smoke on DSMK, as posited by TPB. However, this was not possible with the present cross-sectional data, as a later assessment of actual behavior was not obtained.

School level differences in the prediction of intentions to smoke and daily smoking. For intentions and DSMK, the results of this dissertation suggested that within TPB-E the additive and some of the interactive effects of positive expectancies may better predict intentions and DSMK in middle school than in high school, as hypothesized. No school level differences were found in the additive effects of negative expectancies on intentions or DSMK. Lastly, moderate support for the interactive effects of negative expectancies suggested that within TPB-E negative expectancies may have better predicted intentions to smoke in high school than in middle school.

These school level differences in the additive effects of positive expectancies and the interactive effects of negative expectancies were consistent with Chassin et al. (1991) and Morgan and Grube (1989). In particular, these authors found that positive expectancies were more important predictors of smoking behavior in middle school than in high school and that negative expectancies were more important predictors of smoking behavior in high school than in middle school. Chassin et al. (1991) argued that the importance of the short-term consequences of positive expectancies (e.g., feeling more comfortable in a social situation) for smoking behavior may decrease as adolescents become older and more concerned with long-term consequences of smoking.

However, it is puzzling that Chassin et al.'s (1991) and Morgan and Grube's assertion that negative expectancies would be more important in high school than in middle school was only moderately supported by the interactive effects (i.e., Hypothesis 2d), and was not supported by the additive effects. Furthermore, mean levels of negative expectancies were only slightly higher in high school than in middle school. This suggests that negative expectancies were not much more important in high school than in middle school and yet its interactive effect with self-efficacy was significantly more important in high school than middle school. This may be explained by examining the mean levels of self-efficacy, which appeared to be moderately higher across each grade in comparison to negative expectancies. That is, the moderate support found for Hypothesis 2d may have been due, at least in part, to the higher importance adolescents placed on self-efficacy and it's interactive effect with negative expectancies in high school compared to middle school. This would explain why mean level increases in negative

expectancies were not prominent, yet the interactive effect of negative expectancies with self-efficacy was stronger in high school than in middle school.

Additionally, perhaps this dissertation would have found more support for Chassin et al. (1991) and Morgan and Grube (1987) (i.e., additive effects of negative expectancies were stronger among older versus younger adolescents) if, like Chassin et al. (1991), freshman college students were included in the sample. The importance of the long-term health consequences of negative smoking expectancies for DSMK (or intentions) may not have increased substantially for many adolescents until they began to move into emerging adulthood and began to take on some adult roles.

Morgan and Grube's (1989) sample of Irish adolescents was of a similar age to the present data, however they found that negative expectancies became stronger predictors of smoking with age. This discrepancy may be due to measurement differences, as the items used to assess negative expectancies were not described. If, for example, their measure of negative expectancies emphasized the expense of smoking , which has been higher in Ireland than in the United States for the past two decades (Center for Disease Control, 1998), financial concerns may have become more important with age as adolescents became more financially independent.

Another reason for the observed school level differences could be the greater number of smokers in high school vs. middle school (e.g., approximately 11 percent in Grade 6 vs. 33 percent in Grade 12). As some adolescents became addicted to smoking as suggested by the Stages of Change model (Flay et al., 1983), positive expectancies may have played a less prominent role in predicting intentions relative to the predictive

power of past smoking (for recently started smokers) and addiction (for continuing smokers).

Smoking status differences in the prediction of intentions to smoke and daily smoking. These results demonstrated that the additive effects of positive and negative expectancies were significantly more important in the prediction of intentions among non-smokers than among smokers. These findings are interesting based on the argument that intentions may have served as a proxy for smoking onset among non-smokers and as a proxy for smoking behavior among smokers (Christiansen et al., 1982; see page 50). That is, the effects of positive and negative expectancies may have been more important in the prediction of adolescents' smoking onset among non-smokers than DSMK among smokers.

With regard to the interactive effects of positive and negative expectancies, many interactions were significantly more important in the prediction of intentions among smokers than non-smokers. Based on the same argument by Christiansen et al. (1982), it could be asserted that many of the interactive effects of positive and negative expectancies with peer smoking may have been more important in the prediction of DSMK among smokers than smoking onset among non-smokers. These findings provided support for Ary and Biglan's (1988) assertion of the importance of examining data from smokers and non-smokers separately in order to identify which predictors may be more important to smoking onset (for non-smokers) versus continuation and intensity (for smokers).

Perhaps, within TPB-E, the additive effects of positive and negative expectancies

were less important in the prediction of intentions for smokers than for non-smokers because smokers are already habitual users of cigarettes who may be addicted to tobacco. That is, much of the variance in smoking intentions among smokers may have been accounted for by variation in addiction.

For the interactive effects, it is unclear why the interactions of positive and negative smoking expectancies with peer smoking were significantly stronger for smokers than non-smokers. Perhaps, among certain schools smokers were exposed to more variation in peer smoking than non-smokers, thereby making peer smoking a more prominent factor in the prediction of smoking intentions. To explain, the current measure of peer smoking avoided the problem of peer selection effects (page 54) by computing the mean of peer smoking across each grade and school, but was not able to control for school level selection effects. That is, some schools may have had more smokers than others. Presumably, schools with more smokers may have had more variation in peer smoking because smokers probably engaged in smoking behavior at different frequencies. Likewise, schools with more non-smokers probably had less variation in smoking as non-smokers did not engage in smoking behavior (i.e., zero variance in peer smoking among non-smokers).

Hence, based on these school selection differences, more variation in peer smoking may have existed among smokers than among non-smokers, thereby making it more important in the prediction of intentions to smoke among smokers than among non-smokers. Support for this effect was found (to some extent) in high school, where peer smoking appeared to be a more important predictor of intentions to smoke among high

school smokers than high school non-smokers.

It should be noted that despite the observed school level and smoking status differences, there were many similarities in the predictive additive and interactive relationships with intentions to smoke and DSMK. That is, the direction or sign (i.e., positive or negative) of the associations for each main effect was the same across all four groups. For example, positive expectancies and peer smoking were always positively related to intentions to smoke. Similarly, as stated earlier, the directions of many of the interactive associations with intentions to smoke were consistent with Jessor et al. (1995) and Rutter (1987). Additionally, positive expectancies consistently predicted more variance in intentions to smoke and DSMK than each of the other predictors. Hence, despite some school level and smoking status differences, it can be argued that the present additive and interactive relationships are relatively similar among middle school smokers, middle school non-smokers, high school smokers, and high school non-smokers.

Social Cognitive Theory

Bandura (1986) argued that behavioral expectancies develop indirectly through vicariously learning or directly through engagement in the behavior. For example, adolescents' smoking expectancies may be initially formed through vicarious learning such as observing a peer becoming more socially accepted after engaging in smoking behavior. Subsequently, adolescents' vicariously formed expectancy for social acceptance may be reinforced by the direct experience of smoking a cigarette, where ACS may play a role in the development of expectancies. However, without using a

longitudinal design to determine temporal ordering of relationships (Menard, 1991), this present cross-sectional design was unable to determine the correct specification of the direction of the model (i.e., expectancies predicting DSMK or vice-versa).

However, by using intentions to smoke as a proxy for DSMK among non-smokers, this dissertation was able to test (to some extent) the hypothesis that vicariously learned expectancies predicted DSMK. Indeed, the significant relationships identified between positive and negative expectancies and intentions provided support consistent for this social cognitive process. That is, consistent with Bandura (1986), these relationships suggested that expectancies among non-smokers may have developed vicariously rather than from direct experience. These findings also support Christiansen et al. (1982), who used this procedure for evaluating the influence of social cognitive processes on alcohol use.

Risk and Protective Interactive Effects Explaining Problem Behavior

Implicit to the hypotheses proposed by this dissertation, positive smoking expectancies and peer smoking were posited to be risk factors that would increase the likelihood of adolescents intending to smoke cigarettes, while negative smoking expectancies and self-efficacy to abstain from smoking were posited to be protective factors that would decrease the likelihood of adolescents intending to smoke.

These risk and protective factors were defined in accordance with Rutter's (1987) and Jessor et al.'s (1995) conceptualization of risk and protective factors. Rutter (1987) defined risk and protective factors as independent predictors of behavior that were conceptually and empirically distinct and not merely opposite ends of a single dimension,

which were highly correlated. Jessor et al. (1995) expanded on Rutter's (1987) argument by hypothesizing and finding that risk and protective factors worked additively and interactively together to predict risk behavior. Furthermore, Jessor and colleagues (1995) argued that not all risk and protective factors are conceptually and empirically distinct, but that there is heuristic (explanatory) value in examining those risk and protective factors that are because they exert independent and interactive effects on risk behaviors. The author of this dissertation agrees with this idea that some protective factors (e.g., self-efficacy to abstain from smoking) are empirically distinct from or not highly correlated with other risk factors (e.g., positive expectancies) and, as such, these types of protective and risk factors can work independently and interactively to predict risk behavior.

Jessor et al. (1995) tested these ideas empirically in a sample of 2410 adolescents in Grades 7, 8, and 9. A within-occasion protective factor by risk factor interaction predicting risk behavior was obtained in a direction that supported their hypotheses. Specifically, the effect of peer smoking (i.e., risk factor) on smoking behavior was weakened by the moderating effect of attitudinal intolerance for deviance and perceived parental and peer regulatory controls (i.e., protective factors).[7] Rutter's (1987) and Jessor et al.'s (1995) ideas regarding protective and risk interactive effects help to better understand the interactions of this dissertation, including those that did not support the initial hypotheses. That is, based on their ideas that protective and risk factors work interactively to predict behavior, and Jessor et al.'s findings that protective factors weakened the effect of risk factors on risk behavior, it seems likely that risk factors may

also weaken the effect of protective factors on risk behavior. Furthermore, it also seems likely that if a risk factor by risk factor interaction, or a protective factor by protective factor existed, the shape would be such that the moderating effects (e.g., protective factors) strengthened the effect of the other independent variable (e.g., protective factor) on risk behavior.

To be clear, based on Rutter's (1987) and Jessor and colleagues (1995) ideas, two types of interactions between risk and protective factors seem likely to exist: (1) risk factor by protective factor interactions, where the moderating effect (e.g., risk factor) weakens the effect of the other independent variable (e.g., protective factor), and (2) protective factor by protective factor, or risk factor by risk factor interactions, where the moderating effect strengthens the effect of the other independent variable. Conversely, two other types of interactions seem both unlikely to exist and contrary to Jessor et al.'s conceptualization: (3) risk factor by protective factor interactions, where the moderating effect strengthens the effect of the other independent variable on risk behavior, and (4) protective factor by protective factor interactions and risk factor by risk factor interactions, where the moderating effect weakens the effect of the other independent variable on risk behavior.

In support of the first two types of interactions, the findings of this dissertation predicting intentions to smoke suggested that the risk and protective interactive effects were such that the predictive effect of one (e.g., risk factor) on behavior was weakened by the moderating effect of another (e.g., protective factor). Additionally, risk by risk and protective by protective interactive effects were such that the effect of one (e.g.,

protective factor) was strengthened by the other (e.g., protective factor). All but one interaction could be described by these types of protective and risk interactive effects on smoking intentions. The exception was the interaction of positive expectancies with peer smoking (see Figure 9).

The following discusses how all but one of the significant interactive effects predicting intentions were consistent with ideas based on Jessor et al.'s (1995) and Rutter's (1987) conceptualization of risk and protective interactive effects. Within the following discussion, the interactions supporting the hypotheses of this dissertation are presented first, followed by a discussion of the significant interactions that were inconsistent with the hypotheses.

Risk and protective interactive effects within an adapted and extended theory of planned behavior. As predicted in Hypothesis 2a, Figure 8 illustrates that the relationship of peer smoking with intentions to smoke was stronger among adolescents with higher positive expectancies. Here, positive expectancies played the role of a risk factor within TPB-E that increased the predictive risk effect of peer smoking on intentions. Similarly, as predicted in Hypothesis 2b, Figure 11 illustrates how the effect of peer smoking was weaker among adolescents with higher negative expectancies, where negative expectancies acted as a moderating protective factor. Similar arguments could be made for interpreting Figures 14 to 17, which demonstrated consistent support for Hypothesis 2d. For these figures, negative expectancies acted as a protective moderating factor that strengthened the protective effect of self-efficacy to abstain from smoking on intentions to smoke.

The significant interactions that did not support the hypotheses of this dissertation were also consistent with risk and protective interactive effects as conceptualized in Jessor et al. (1995) and Rutter (1987). For example, Figure 10 suggested that the effect of peer smoking on intentions was stronger among adolescents with higher negative expectancies, a direction opposite to Hypothesis 2b. Here, the moderating protective effect of negative expectancies strengthened the risk effect of peer smoking on intentions, instead of weakening it in accordance with Jessor et al. (1995) and Rutter (1987). However, upon careful examination of Figure 10, this relationship revealed that peer smoking acted as the moderator between the relationship of negative expectancies and intentions to smoke (see Figure 22). That is, consistent with Jessor et al. (1995) and Rutter (1987), peer smoking acted as a moderating risk factor that weakened the protective effect of negative expectancies on intentions.

Figures 12 and 13 also demonstrated effects that are opposite to Hypotheses 2c, where the effect of self-efficacy to abstain from smoking on intentions was stronger among adolescents with higher positive expectancies. That is, the moderating risk effect of positive expectancies strengthened the protective effect of self-efficacy instead of weakening it. Indeed, based on the ideas of Jessor et al. (1995) and Rutter (1987), moderating risk effects should weaken, and not strengthen, protective effects. However, when self-efficacy to abstain from smoking was viewed as the moderator of the relationship between positive expectancies and intentions to smoke, the shape of the interaction demonstrated support for a risk by protective interactive effect as conceptualized by Jessor et al. (1995) and Rutter (1987) (see Figure 23). In particular,

Figures 12 and 13 demonstrated that the protective moderating effect of self-efficacy on intentions weakened the risk effect of positive expectancies on intentions.

All of these significant interactions suggested that risk and protective factors worked interactively to predict intentions to smoke (Jessor et al., 1995; Rutter, 1987). All but one moderating risk factor amplified the effect of other risk factors on intentions to smoke, or weakened the effect of a protective factor on intentions to smoke among adolescents with higher levels of the moderating risk factor. Additionally, all moderating protective effects intensified the effect of other protective factors on intentions to smoke, or weakened the effect of a risk factor on intentions to smoke among adolescents with higher levels of the moderating protective factor.

These interactions are also important because they highlight the importance of the additive and interactive effects of protective factors, in addition to risk factors, for the explanation of smoking behavior within TPB-E. On a broader scale, these findings have demonstrated the importance of protective factors within a field that has just recently begun to focus on protective factors, in addition to risk factors, to explain risk behaviors (see review by Jessor et al., 1995). Given that the most robust and consistent interactive finding of this dissertation involved an interaction between two protective factors (i.e., negative expectancies with self-efficacy to abstain from smoking), the importance of protective factors within TPB-E was especially highlighted.

Conclusion

Implications for Prevention

The present dissertation has important implications for prevention concerning the

influence of positive and negative expectancies, peer smoking, and self-efficacy on adolescents' smoking intentions and behavior. In particular, the ideas posited by TPB-E may help in the development of successful prevention programs that aim to reduce adolescents' levels of smoking by decreasing adolescents' positive expectancies and exposure to peer smoking, and by increasing adolescents' negative expectancies and self-efficacy to abstain from smoking (Maggs & Schulenberg, 1998).

For example, following the prevention approach of the Alcohol Misuse Prevention Study (AMPS) (Dielman, 1994; Dielman, Shope, Butchart, & Campanelli, (1986), program developers could attempt to decrease adolescents' smoking intentions and smoking behavior through an intervention designed to reduce adolescents' positive smoking expectancies and to increase adolescents' negative smoking expectancies and self-efficacy to abstain from smoking. Based on social learning influences (Dielman, 1994), an intervention curriculum designed to: (1) decrease adolescents' beliefs regarding the positive consequences of smoking (i.e., positive expectancies), (2) increase adolescents' awareness of the long-term negative consequences of smoking (i.e., negative expectancies), and (3) teach adolescents and having them practice the skills necessary to refuse internal and external pressures to smoke (i.e., self-efficacy to abstain from smoking) could be administered to adolescents considered at risk for engaging in smoking behavior. In turn, such an intervention might also indirectly reduce levels of adolescents' exposure to peer smoking by reducing levels of adolescent smoking (i.e., less adolescents smoking by definition means lower exposure to peer smoking on average). In other words, the present findings may be useful to practitioners and program

developers who attempt to remedy cognitive or interpersonal deficits through intervention in order to reduce adolescent risk behaviors (see review by Botvin, 1999).

To provide much stronger support for the relationships posited in TPB-E, the next step would be to conduct an experimental test with random assignment to conditions. For example, researchers could randomly assign different schools to treatment and control conditions (Dielman et al., 1986). The intervention as described above could be implemented in the treatment group, and the control condition would not receive any type of treatment. Accordingly, researchers could assess adolescents' levels of smoking intentions and smoking behavior in both groups prior to and after treatment, and then test for significant post-treatment group differences in the levels of these constructs.

Additionally, based on the school level differences found in the predictive (additive) effects of positive expectancies on intentions to smoke and smoking behavior, programmers may need to focus more on decreasing the importance of adolescents' positive expectancies in middle school, rather than waiting until high school. That is, although positive expectancies was still one of the most important predictors of intentions and daily smoking in high school, the results of the school level hypotheses suggested that positive expectancies were more important in middle school. Moreover, in accordance with the smoking status differences found in the predictive (additive) effects of positive and negative expectancies on intentions to smoke (see pages 85 to 86 for a more detailed discussion), programmers who focus on changing adolescents' perceptions of positive and negative expectancies may have more success in preventing the onset of smoking among non-smokers, than in decreasing smoking behavior among smokers. As

mentioned on page 104, this may be due in part to the development of habitual smoking and to psychological and physiological addiction to tobacco.

By using these ideas, prevention programs (e.g., Botvin, 1994; 1999; Patterson, 1998; Patterson & Fleischman, 1979) may begin to decrease adolescents' levels of smoking intentions and smoking behavior. Lastly, the knowledge and skills adolescents (in the treatment group) learn regarding the consequences of smoking behavior and peer pressure to smoke, respectively, may be generalized to other risk behavior situations. That is, many adolescents may start to wonder about the positive and negative consequences of other risk behaviors. This generalized knowledge and skill attained from the treatment condition may help adolescents reduce, at least somewhat, their engagement in other risk behaviors as well.

Strengths and Limitations

The major strengths of this dissertation derive from the characteristics of the sample, the measurement of peer smoking, and the theory-based hypotheses. Specifically, the present study utilized a large representative sample from many central and southeastern counties in Texas. Additionally, this sample included adolescents within an age range (i.e., Grade 6 to Grade 12) where smoking is initiated and variance in smoking behavior increases substantially (O'Malley et al., 1998). With such a large sample size, adequate numbers of smokers in middle school and high school were available for analysis. Some prior studies have had insufficient numbers to assess differences between smokers and non-smokers (see Ary & Biglan, 1988). Lastly, the use of anonymous rather than confidential surveys may have increased the validity (i.e.,

honesty) of adolescents' responses, as they had no reason to fear that a teacher or parent would gain knowledge of their responses.

The type of measurement used for peer smoking was an additional strength of this dissertation because it controlled for selection effects. Previous studies (e.g., Chassin et al., 1991; Eiser et al., 1989; Grube et al., 1986) may have overestimated the associations of peer smoking with adolescent smoking because their measures of peer smoking did not take into account processes of peer selection. In other words, their measures assessed peer smoking among adolescents' immediate friends, who probably shared similar smoking preferences as the adolescents being measured (Cohen, 1977; Kandel, 1978, 1996). By measuring peer smoking as the average of student reports within grades and schools, such overestimates may have been avoided.

A third strength of the present study is that it had theoretically based hypotheses, of which, the additive effects were clearly supported and the interactive effects were moderately supported, with the negative expectancies by self-efficacy interaction receiving the most robust and consistent support. The present results are important because they replicated the ideas of Rutter (1987) and supported the findings of Jessor et al. (1995) regarding the interactive effects of risk and protective factors predicting risk behavior. Lastly, the findings of this dissertation highlighted the importance of protective factors in the study of risk behaviors.

Limitations of this study included problems with measurement and design. One measurement weakness was the cross-loading of two negative expectancies items on intentions to smoke. Although these items were retained as indicators of the negative

expectancies factor and not intentions, these cross-loadings indicated a problem of interdependence between the two factors, directly increasing the likelihood of a significant relationship between negative expectancies and intentions. That is, the significant relationships between negative expectancies and intentions may have been overestimated. In addition, the low alpha (.60) for negative expectancies may have decreased the size of correlations with the other variables, thereby perhaps underestimating the true relationship between negative expectancies and the two smoking outcome variables. For these two reasons, the size of the predictive relationships involving negative expectancies should be interpreted with caution.

Another potential measurement limitation was the use of self-report and possible shared method variance. Shared method variance, in this case the amount of variance attributable to the fact that adolescents provided all of the data via self-report, with the exception of the peer smoking data, may have inflated the observed relationships (Campbell & Fiske, 1959). The use of multiple methods (e.g., experience sampling methods) and/or multiple reporters (e.g., parent reports of adolescent smoking or peer reports of their own smoking) would have allowed this issue to be addressed more directly and may have provided additional evidence for validity of the constructs used in this dissertation. Lastly, as mentioned previously, the key constructs of this dissertation were somewhat skewed and therefore may have biased the regression coefficients (Hammer & Landau, 1981). However, Cohen and Cohen (1983) have argued that multiple regression is robust to the violation of the normal distribution assumption. Accordingly, the obtained results should be interpreted as valid (but cautionary) estimates

of the linear relationships proposed in this dissertation.

Design limitations include the lack of longitudinal data following adolescents from non-smoking status through the five possible stages of change (Flay et al., 1983). That is, a disadvantage of cross-sectional designs includes the inability to model the temporal ordering of events and associations within-persons (Bergman, Eklund, & Magnusson, 1991; Menard, 1991). The present cross-sectional analyses estimated the existence, magnitude, and direction of the associations between the major constructs of this dissertation, but did not provide information about the order in which events occurred or which variables predicted subsequent levels of the hypothesized outcomes.

Another design limitation is the use of a pre-experimental within-occasion design, rather than an experimental design, thereby introducing potential questions about the internal validity of the findings (Campbell & Stanley, 1963). Caution in interpreting the present findings is warranted because random assignment of adolescents to conditions of different levels of the major constructs of TPB-E was not used. Though not practically possible, random assignment of adolescents to varying levels of expectancies and self-efficacy would have permitted the ruling out of other third variable explanations. Similarly, it would be not ethical to assign students randomly to attend low, medium, and high smoking schools. Given the present passive correlational design, direct evidence about the true causal nature of the hypothesized relationships cannot be obtained.

Directions for Future Research

This dissertation has provided evidence concerning the associations of adolescents' positive and negative expectancies, peer smoking, self-efficacy to abstain

from smoking, and their interactions with intentions to smoke and smoking behavior under an extended and adapted TPB-E. It is hoped that the present findings, along with other studies that have found empirical support for the assumptions of TPB (for a review see Petraitis et al., 1995), will encourage future research to examine how the additive and interactive effects within TPB-E influence adolescent smoking intentions and smoking behavior for both theoretical and preventative purposes.

For example, future research could attempt to expand the findings of this dissertation by comparing the predictive efficacy of TPB-E with other models of behavior such as Problem Behavior Theory (Jessor & Jessor, 1977) or social learning theory (Bandura, 1977). Such comparisons would reveal whether positive expectancies remained one of the most important predictors of intentions to smoke and smoking behavior. Additionally, the interaction effects posited within zTPB-E could be evaluated against other interactive effects such as the protective by risk interaction posited by Jessor et al. (1995). These type of future studies may provide insight into how smoking expectancies may fit into more complex moderational models of smoking behavior discussed in the smoking expectancies literature (see review by Brandon et al. 1999; Marlatt, 1985). On a broader scope, a comparison of TPB-E with other theories of behavior could contribute to the literature on risk behaviors by highlighting the importance of interactive effects between risk and protective factors.

Another direction for future research could be to attempt to replicate the findings of this dissertation using a nationally representative sample. As stated earlier (page 67), the percentage of middle and high school smokers in Texas, as assessed in the present

sample, was higher than national prevalence rates. Perhaps smoking was more important to adolescents in the present sample than to adolescents in other states, which may have made the relationship between positive expectancies and daily smoking stronger in Texas middle schools than in other states middle schools.

Additionally, even though large gender differences in the prevalence of smoking were not hypothesized or observed in this sample (page 50), previous studies have indicated that gender differences may exist in the correlates and predictors of smoking behavior (e.g., Waldron, Lye, & Brandon, 1991). Therefore, future research should explore gender differences to examine the extent to which similar or different results are observed for male and female adolescents above and beyond differences or similarities in prevalence. Other directions for research could be to attempt to expand the findings of this dissertation regarding the school level hypotheses by measuring the constructs of TPB-E across adolescence and into adulthood. For example, similar cross-sectional designs could evaluate whether the positive expectancies are even less important in adulthood in comparison to high school. In addition, the replication of Chassin et al.'s (1991) findings regarding negative expectancies could be attempted by examining whether negative expectancies were more important to college students than high school or middle school students.

Other avenues of research could examine the proposed relationships of this dissertation within a longitudinal design, which would allow for the assessment of the temporal ordering of these relationships and a better understanding of how the constructs within TPB-E change (or stay the same) throughout the five stages of smoking (Flay et

al., 1983). Moreover, a longitudinal design could be used to assess which factors within TPB-E were more important to the prediction of smoking onset, maintenance, quitting, and relapse. This type of analytic strategy would provide a more appropriate evaluation of smoking status hypotheses forwarded in this dissertation. In particular, smoking onset could be measured directly over time instead of using intentions as a proxy for behavior within a cross-sectional design. Additionally, a longitudinal design would also allow for more appropriate testing of Bandura's (1986) assumptions regarding vicariously learned expectancies. That is, if positive and negative expectancies were found to significantly predict smoking onset among non-smokers over time, it could be argued that expectancies that predicted smoking onset developed vicariously through observation of smoking related events, and not from the direct experience of smoking. To further explore these latter ideas, future research utilizing TPB-E to investigate the additive effects of expectancies on smoking intentions should examine the predictive efficacy of TPB-E separately among smokers and non-smokers (Ary & Biglan, 1988), and include past smoking behavior as predictor of current smoking behavior among smokers.

Additionally, the findings of this dissertation could be tested experimentally by using a short-term longitudinal study with random assignment to conditions. Perhaps, decreasing positive expectancies, and increasing negative expectancies and self-efficacy through experimenter intervention would lead to decreases in adolescents' intentions to smoke and smoking behavior. This could lead to more robust findings regarding the hypothesized relationships of this dissertation and thus would begin to provide more direct evidence about the true causal nature of the hypothesized relationships.

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FOOTNOTES

[1] Tolman did discuss in 1955 how expectancies were linked to actual behaviors via expectancy-value models.

[2] TRAs conceptualization of attitudes and expectancies is part of an unresolved theoretical debate (Stacy et al., 1990). That is, TPB argued that expectancies are a cognitive component of attitudes and, as such, are not conceptually distinct from attitudes but are the same as attitudes (Ajzen, 1991). However, other researchers have asserted that expectancies and attitudes may be conceptually distinct factors, and that this proposition should be empirically examined (Christiansen & Goldman, 1983; Stacy et al., 1990). While this is an important issue both theoretically and empirically, it is beyond the scope of this dissertation and was not be addressed here. The focus of this dissertation remains on the role of expectancies in TPB and in the development of adolescent smoking. Lastly, the term expectancy is used instead of attitudes, although the author of this dissertation realizes that some readers may use the terms expectancies and attitudes interchangeably as posited by TPB (Ajzen, 1991).

[3] Flay et al.'s (1983) stages of change theory also discussed a fifth stage called adult smoking, which described more advanced and long-term smoking in adulthood. Hence, this stage is not discussed because it is likely to not be as important or relevant to the etiology of adolescent smoking and smoking expectancies as the other four stages, which focus on adolescence

[4] This is not to imply that these studies used these exact items, but that the meaning of the items was similar and drawn from the same content domains. The

example items are used only to illustrate the common content domain of the measures.

[5] The Texas Education Agency indicated that not all middle schools and high schools followed this classification (i.e., middle school = Grades 6 to 8 and high school = Grades 9 to 12), although the majority of schools in Texas did. For example, some 9th graders might have been in a junior high (middle school), and therefore would have been incorrectly classified as in "high school". However, this problem was addressed within the sampling strategy of the Texas Tobacco Prevention Initiative. For example, if a junior high school had Grades 6 to 9 in it, only Grades 6 to 8 were sampled. Or, if a middle school had included Grade 5, Grade 5 was not sampled. Hence, all students in Grades 6 to 8 were correctly classified as middle school students and all students in Grades 9 to 12 were correctly classified as high school students.

[6] Examination of two of the four interactions revealed what appeared to be significant cross-over effects, where smokers with lower levels of self-efficacy in middle school (see Figure 14) and high school (see Figure 16), reported higher intentions to smoke by adolescent smokers with higher, and not lower, levels of negative expectancies. However, the differences in intentions were not significant (2.69 vs. 2.71 in middle school and 3.03 vs. 2.95 in high school). Additionally, among middle school smokers (see Figure 14) who reported lower levels of negative expectancies, higher levels of intentions were unexpectedly reported by adolescent smokers with higher, and not lower, levels of self-efficacy (i.e., 2.71 vs. 2.69, respectively). However, this difference in intentions was also not significant.

[7] Jessor et al. (1995) used a combined protective factor index consisting of

positive orientation towards school, positive orientation towards health, attitudinal intolerance of deviance, positive relations with adults, perceived regulatory controls, friends model for conventional behavior, and prosocial activities. Similarly, a combined risk factor index was used, which consisted of expectations for success (e.g., low expectations), self-esteem (e.g., low self-esteem), hopelessness, peer smoking, parents versus friend orientation (e.g., adolescents more like friends than parents), and Grade Point Average). Additionally, Jessor suggested that attitudinal intolerance and perceived regulatory controls were among (i.e., first and third, respectively) the strongest protective effects on risk behaviors and that peer smoking demonstrated the strongest risk effect on risk behavior. Due to these associations being the most robust, and the similarity of their measures to the negative expectancy (versus attitudinal intolerance), self-efficacy-an internal control (versus parent and peer external controls), and peer smoking measures of this dissertation, these measures of Jessor et al. are the only ones mentioned in the text.

Table 1
Constructs, Items, and Factor Loadings: Positive and Negative Smoking Expectancies, Peer Smoking, Self-efficacy to Abstain from Smoking, and Intentions to Smoke and Daily Smoking.

Constructs and items
Positive Smoking Expectancies [a]
1. Do you believe smoking can help people when they are bored? (.57) (.63) (.56) (.55) (.67)
2. Do you believe smoking helps people relax? (.51) (.64) (.48) (.32) (.81)
3. Do you think smoking cigarettes helps people feel more comfortable at parties and in other social situations? (.63) (.70) (.62) (.60) (.73)
4. Do you think smoking cigarettes is good for weight control? (.55) (.58) (.55) (.53) (.50)
5. Do you think young people who smoke cigarettes have more friends? (.73) (.72) (.73) (.75) **(.67)**
6. Do you think smoking cigarettes makes young people look cool or fit in? (.76) (.74) (.76) (.80) **(.76)**
7. Is smoking a sign of being older or more grown-up? (.73) (.71) (.73) (.76) **(.72)**
Negative Smoking Expectancies [a]
1. Can people get addicted to cigarette smoking just like they can get addicted to cocaine or heroin? (.67) (.65) (.69) (.59) (.60)
2. Does tobacco kill more Texans that alcohol, AIDS, illegal drugs, auto accidents, suicides, homicides, and fires combined? (.58) (.60) (.57) (.51) (.53)
3. Does tobacco smoke smell and taste horrible? (.45) (.46) (.43) (.51) (.59)
4. Do you think the smoke from other people's cigarettes is harmful to you? (.63) (.62) (.63) (.59) (.66)
5. If I smoke (or were to smoke) I would consider this stupid of me. (.42) (.40) (.43) (.57) (.51)

TABLE 1 - Continued

Peer Smoking and Daily Smoking[b]

1. During the past 30 days, on the days you smoked, how many cigarettes did you smoke per day?

Self-Efficacy to Abstain from Smoking[a]

1. If your friends offer you a cigarette, are you able not to smoke? (.81) (.81) (.81) (.80) (.80)
2. If you are with friends who smoke, are able not to smoke? (.85) (.84) (.85) (.83) (.85)
3. If you feel nervous, are you able not to smoke? (.85) (.86) (.84) (.83) (.85)
4. If you are depressed, are you able not to smoke? (.82) (.83) (.81) (.79) (.86)

Intentions to Smoke[a]

1. Do you think that you will try a cigarette soon? (.75) (.75) (.74) (.56) (.65)
2. Do you think you will smoke a cigarette at any time during the next year? (.83) (.79) (.84) (.78) (.84)
3. Do you think you will be smoking cigarettes 5 years from now? (.70) (.68) (.71) (.51) (.73)
4. If any of your best friends offered you a cigarette, would you smoke it? (.80) (.76) (.81) (.72) (.80)

Note: Factor loadings in parentheses are for the total sample, middle school, high school, smokers, and non-smokers, respectively. For non-smokers, two positive expectancy factors were found. Factor one consisted of the first four items in regular text. The second factor consisted of the last three items in bold. [a] 1 = definitely not, 2 = probably not, 3 = probably yes, 4 = definitely yes. [b] 1 = zero, 2 = less than one cigarette per day, 3 = 1 cigarette per day, 4 = 2 to 5 cigarettes per day, 5 = 6 to 10 cigarettes per day, 6 = 11 to 20 cigarettes per day, and 7 = more than 20 cigarettes per day.

Table 2

Descriptive Statistics by Grade: Positive Smoking Expectancies, Negative Smoking Expectancies, Peer Smoking, Self-Efficacy to Abstain from Smoking, Intentions to Smoke, and Daily smoking

Variable	Grade 6			Grade 7			Grade 8			Grade 9		
	M	SD	n	M	SD	n	M	SD	n	M	SD	n
PSE	1.48	.55	3640	1.53	.53	4468	1.58	.56	4063	1.62	.55	3751
	2.55	*.81*	*433*	*2.43*	*.71*	*862*	*2.39*	*.69*	*1208*	*2.38*	*.65*	*1419*
NSE	3.31	.54	3626	3.34	.52	4443	3.35	.52	4033	3.34	.53	3727
	2.62	*.75*	*431*	*2.78*	*.59*	*854*	*2.75*	*.63*	*1188*	*2.76*	*.62*	*1410*
PSMK	1.23	.14	3652	1.37	.16	4483	1.55	.20	4085	1.76	.21	3761
	1.35	*.23*	*436*	*1.46*	*.19*	*865*	*1.64*	*.23*	*1205*	*1.83*	*.19*	*1426*
SE	3.33	.95	3567	3.44	.85	4412	3.50	.80	3991	3.58	.75	3703
	2.52	*1.02*	*423*	*2.72*	*.89*	*849*	*2.75*	*.94*	*1175*	*2.75*	*.95*	*1388*
IS	1.31	.53	3653	1.39	.56	4485	1.48	.60	4079	1.49	.60	3764
	2.82	*.79*	*438*	*2.85*	*.65*	*865*	*2.89*	*.62*	*1198*	*2.93*	*.61*	*1417*
DSMK	1.00	.00	3652	1.00	.00	4483	1.00	.00	4085	1.00	.00	3761
	3.82	*1.75*	*436*	*3.46*	*1.35*	*865*	*3.66*	*1.35*	*1205*	*3.85*	*1.31*	*1426*

TABLE 2 - *Continued*

Variable	Grade 10			Grade 11			Grade 12		
	M	SD	n	M	SD	n	M	SD	n
PSE	2.38	.53	3258	1.62	.53	2619	1.63	.56	2167
	2.31	*.63*	*1273*	*2.27*	*.60*	*1167*	*2.31*	*.67*	*1080*
NSE	2.76	.50	3239	3.39	.49	2604	3.41	.50	2152
	2.83	*.58*	*1266*	*2.89*	*.57*	*1163*	*2.91*	*.57*	*1072*
PSMK	1.80	.24	3275	1.89	.24	2640	2.04	.24	2187
	1.89	*.24*	*1281*	*1.96*	*.20*	*1173*	*2.11*	*.21*	*1082*
SE	2.75	.65	3213	3.71	.64	2584	3.75	.63	2131
	2.82	*.96*	*1255*	*2.92*	*.93*	*1147*	*2.88*	*1.00*	*1061*
IS	1.45	.57	3271	1.41	.55	2630	1.39	.52	2181
	2.92	*.59*	*1274*	*2.89*	*.59*	*1168*	*2.92*	*.57*	*1079*
DSMK	1.00	.00	3275	1.00	.00	2640	1.00	.00	2187
	3.96	*1.30*	*1281*	*3.99*	*1.25*	*1173*	*4.24*	*1.34*	*1082*

Note. The top number in the variable rows is for non-smokers and the bottom italicized number is for smokers. PSE = positive smoking expectancies; NSE = negative smoking expectancies; PSMK = Peer smoking; SE = self-efficacy to abstain from smoking, IS = intentions to smoke, and DSMK = daily smoking.

Table 3
Descriptive Statistics by Grade among Smokers: Frequency, Percentage, and Cumulative Percentage of Daily smoking

Response Item	Grade 6			Grade 7			Grade 8			Grade 9		
	FREQ	%	Cum%	FREQ	%	Cum%	FREQ	%	Cum%	FREQ	%	Cum%
< 1	137	31.4	31.4	269	31.1	31.1	285	23.7	23.7	270	18.9	18.9
1	79	18.1	49.5	173	20.0	51.1	264	21.9	45.6	252	17.7	36.6
2 to 5	98	22.5	72.0	293	33.9	85.0	424	35.2	80.7	559	39.2	75.8
6 to 10	40	9.2	81.2	55	6.4	91.3	104	8.6	89.4	187	13.1	88.9
11 to 20	11	2.5	83.7	33	3.8	95.1	65	5.4	94.8	90	6.3	95.2
20 or more	71	16.3	100.0	42	4.9	100.0	63	5.2	100.0	68	4.8	100.0
Total	436	100.0		865	100.0		1205	100.0		1426	100.0	

TABLE 3 - *Continued*

Response Item	Grade 10			Grade 11			Grade 12		
	FREQ	%	Cum%	FREQ	%	Cum%	FREQ	%	Cum%
< 1	198	15.5	15.5	178	15.2	15.2	127	11.7	11.7
1	216	16.9	32.3	160	13.6	28.8	147	13.6	25.3
2 to 5	536	41.8	74.2	512	43.6	72.5	418	38.6	64.0
6 to 10	166	13.0	87.1	185	15.8	88.2	192	17.7	81.7
11 to 20	99	7.7	94.8	96	8.2	96.4	124	11.5	93.2
20 or more	66	5.2	100.0	42	3.6	100.0	74	6.8	100.0
Total	1281	100.0		1173	100.0		1082	100.0	

Note. FREQ = frequency of responses for item, % = percentage of responses for item, Cum% = cumulative percentage of item. < 1 = less than one cigarette smoked daily during the past 30 days, 1 = one cigarette smoked daily during the past 30 days, 2 to 5 = two to five cigarettes smoked daily during the past 30 days, 6 to 10 = six to ten cigarettes smoked daily during the past 30 days, 11 to 20 = eleven to twenty cigarettes smoked daily during the past 30 days, 20 or more = twenty or more cigarettes smoked daily for the past 30 days.

Table 4

Correlational Analyses: Positive Smoking Expectancies, Negative Smoking Expectancies, Peer Smoking, Self-Efficacy to Abstain from Smoking, Intentions to Smoke, and Daily smoking (Entire Sample)

Variable	PSE	NSE	PSK	SE	PSEPSK	NSEPSK	PSESE	NSESE	IN	DSMK
PSE	1.000	--	--	--	--	--	--	--	--	--
NSE	-.360***	1.000	--	--	--	--	--	--	--	--
PSK	.174***	-.061***	1.000	--	--	--	--	--	--	--
SE	-.319***	.448***	.007	1.000	--	--	--	--	--	--
PSEPSK	.068***	-.032***	.008	-.050***	1.000	--	--	--	--	--
NSEPSK	-.036***	.034***	-.014*	.025***	-.356***	1.000	--	--	--	--
PSESE	-.314***	.149***	-.044***	.224***	-.026***	.074***	1.000	--	--	--
NSESE	.128***	-.460***	.018**	-.423***	.021***	.004	-.282***	1.000	--	--
IN	.633***	-.447***	.225***	-.394***	.061	-.081***	-.279***	.131	1.000	--
DSMK	.498***	-.379***	.244***	-.378***	.149***	-.141***	-.327***	.188***	.706***	1.000

Note. PSE = positive smoking expectancies; NSE = negative smoking expectancies; PSK = peer smoking; SE = self-efficacy to abstain from smoking; PSEPSK = the interaction of positive smoking expectancies and peer smoking; NSEPSK = the interaction of negative smoking expectancies and peer smoking; PSESE = the interaction of positive smoking expectancies and self-efficacy to abstain from smoking; NSESE = the interaction of negative smoking expectancies and self-efficacy to abstain from smoking, IN = intentions to smoke; DSMK = daily smoking.

*$p < .05$. **$p < .01$. ***$p < .001$

Table 5

Correlational Analyses: Positive Smoking Expectancies, Negative Smoking Expectancies, Peer Smoking, Self-Efficacy to Abstain from Smoking, Intentions to Smoke, and Daily smoking (Middle School Smokers and Non-Smokers)

Variable	PSE	NSE	PSK	SE	PSEPSK	NSEPSK	PSESE	NSESE	IN	DSMK
PSE	1.000	*-.224****	*.038*	*-.284****	*-.376****	*.112****	*-.581****	*.308****	*.483****	*.323****
NSE	-.228***	1.000	*-.027*	*.330****	*.108****	*-.375****	*.336****	*-.637****	*-.254****	*-.192****
PSK	.098***	-.026**	1.000	*-.006*	*.626****	*-.577****	*.004*	*.018*	*.064***	*.105****
SE	-.176***	.375***	-.007	1.000	*.132****	*-.127****	*.698****	*-.665****	*-.231****	*-.197****
PSEPSK	-.741***	.170***	-.279***	.117***	1.000	*-.507****	*.269****	*-.131*	*-.176****	*-.072***
NSEPSK	.178***	-.773***	.101***	-.288***	-.233***	1.000	*-.147****	*.243****	*.117****	*.030*
PSESE	-.097***	-.143***	-.028**	-.376***	.054***	.140***	1.000	*-.662****	*-.334****	*-.263****
NSESE	-.030**	-.409***	.013	-.234***	.029**	.313***	.088***	1.000	*.221*	*.243****
IN	.528***	-.278***	.143***	-.211***	-.388***	.213***	-.090***	.004	1.000	*.334****
DSMK	--	--	--	--	--	--	--	--	--	1.000

Note. Italicized correlations in the upper right diagonal are for smokers. Regular text correlations in bottom left diagonal are for non-smokers. PSE = positive smoking expectancies; NSE = negative smoking expectancies; PSK = peer smoking; SE = self- efficacy to abstain from smoking; PSEPSK = the interaction of positive smoking expectancies and peer smoking; NSEPSK = the interaction of negative smoking expectancies and peer smoking; PSESE = the interaction of positive smoking expectancies and self-efficacy to abstain from smoking; NSESE = the interaction of negative smoking expectancies and self-efficacy to abstain from smoking, IN = intentions to smoke; DSMK = daily smoking.

*$p < .05$. **$p < .01$. ***$p < .001$.

Table 6

Correlational Analyses: Positive Smoking Expectancies, Negative Smoking Expectancies, Peer Smoking, Self-Efficacy to Abstain from Smoking, Intentions to Smoke, and Daily smoking (High School Smokers and Non-Smokers)

Variable	PSE	NSE	PSK	SE	PSEPSK	NSEPSK	PSESE	NSESE	IN	DSMK
PSE	1.000	*-.237****	*-.005*	*-.243****	*.642****	*-.166****	*-.523****	*.263****	*.342****	*.264****
NSE	-.183***	1.000	*.030***	*.265****	*-.139****	*.686****	*.291****	*-.583****	*-.231****	*-.169****
PSK	.039***	.033***	1.000	*-.015*	*.508****	*-.387****	*.004*	*-.020*	*.063****	*.130****
SE	-.135***	.418***	.063***	1.000	*-.157****	*.179****	*.669****	*-.594****	*-.293****	*-.330****
PSEPSK	.592***	-.122***	-.160***	-.080***	1.000	*-.393****	*-.336****	*.158****	*.227****	*.244****
NSEPSK	-.111***	.547***	.231***	.214***	-.210***	1.000	*.199****	*-.405****	*-.191****	*-.183*
PSESE	.227***	-.157***	.015	-.205***	.173***	-.069***	1.000	*-.585****	*-.275****	*-.293****
NSESE	-.068***	-.310***	-.022*	-.368***	-.036***	-.083***	.111***	1.000	*.183****	*.226****
IN	.435***	-.270***	.018	-.194***	.252***	-.161***	.052***	-.065	1.000	*.334****
DSMK	--	--	--	--	--	--	--	--	--	1.000

Note. Italicized correlations in the upper right diagonal are for smokers. Regular text correlations in bottom left diagonal are for non-smokers. PSE = positive smoking expectancies; NSE = negative smoking expectancies; PSK = peer smoking; SE = self-efficacy to abstain from smoking; PSEPSK = the interaction of positive smoking expectancies and peer smoking; NSEPSK = the interaction of negative smoking expectancies and peer smoking; PSESE = the interaction of positive smoking expectancies and self-efficacy to abstain from smoking; NSESE = the interaction of negative smoking expectancies and self-efficacy to abstain from smoking; IN = intentions to smoke; DSMK = daily smoking.

*$p < .05$. **$p < .01$. ***$p < .001$.

Table 7

Hierarchical Multiple Regressions: Positive Smoking Expectancies, Negative Smoking Expectancies, Peer Smoking, and Self-Efficacy to Abstain from Smoking Predicting Intentions to Smoke

	Criterion Variable: Intentions to Smoke			
	Middle School (S)	Middle School (N)	High School (S)	High School (N)
	β	β	β	β
Predictors				
Step 1				
PSE	.424*** a, b	.476*** b, c	.339*** a, d	.390*** c, d
NSE	-.159***	-.181***	-.158*** a	-.201*** a
PSMK	.100***	.102***	.090***	.015
SE	-.114***	-.125***	-.280***	-.126***
R^2	.261***	.317***	.179***	.231***
Step 2				
PSE X PSMK	-.029 a	.044*** b	-.085*** a, c	-.003 b, c
NSE X PSMK	.060* a	-.009 a	-.041 p = .065 b	-.002 b
PSE X SE	-.005	-.109*** a	.028 b	-.079*** a, b
NSE X SE	-.107** a	-.076*** b	-.151*** a	-.138*** b
R^2 Δ	.007***	.015***	.014***	.022***
Total R^2	.268***	.332***	.193***	.253***
N	2248	11,648	4791	11,593

Note. (S) = smokers; (N) = non-smokers. PSE = positive smoking expectancies; NSE = negative smoking expectancies; PSMK = peer smoking; SE = self-efficacy to abstain from smoking. Step1 and Step 2 coefficients for the additive effects differed by less than .05 for all groups, so only Step 1 coefficients were listed. Coefficients sharing superscript letters are significantly different.

*p < .05. **p < .01. ***p < .001.

Table 8

Hierarchical Multiple Regressions: Positive Smoking Expectancies, Negative Smoking Expectancies, and Self-Efficacy to Abstain from Smoking Predicting Smoking Behavior (Smokers)

	Criterion Variable: Daily smoking	
	Middle School	High School
	β	β
Predictors		
Step 1		
PSE	.282***[a]	.194***[a]
NSE	-.062**	-.068***
SE	-.016	-.276***
R^2	.147***	.151***
Step 2		
PSE X SE	-.039	-.005
NSE X SE	.094**[a]	-.026[a]
R^2 Δ	.004**	.000
Total R^2	.149***	.151***
N	2407	4826

Note. PSE = positive smoking expectancies; NSE = negative smoking expectancies; PSMK = peer smoking; SE = self-efficacy to abstain from smoking. Step1 and Step 2 coefficients for the additive effects differed by less than .05 for all groups, so only Step 1 coefficients were listed. Coefficients sharing superscript letters are significantly different.
**$p < .01$. ***$p < .001$.

FIGURE 1. The theory of planned behavior.

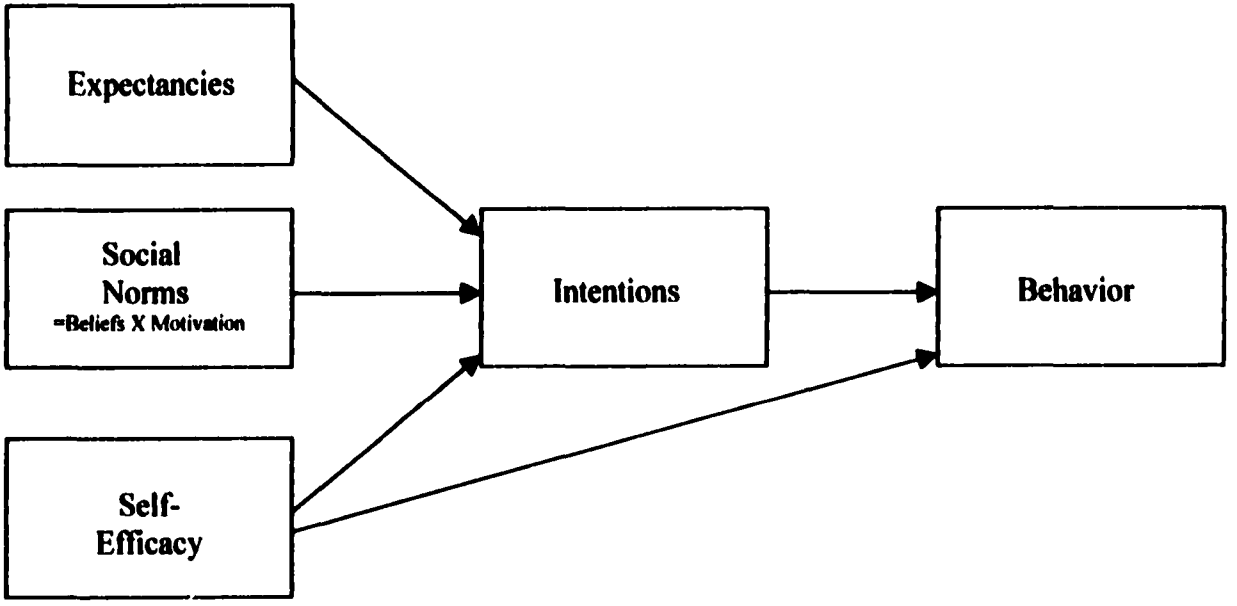
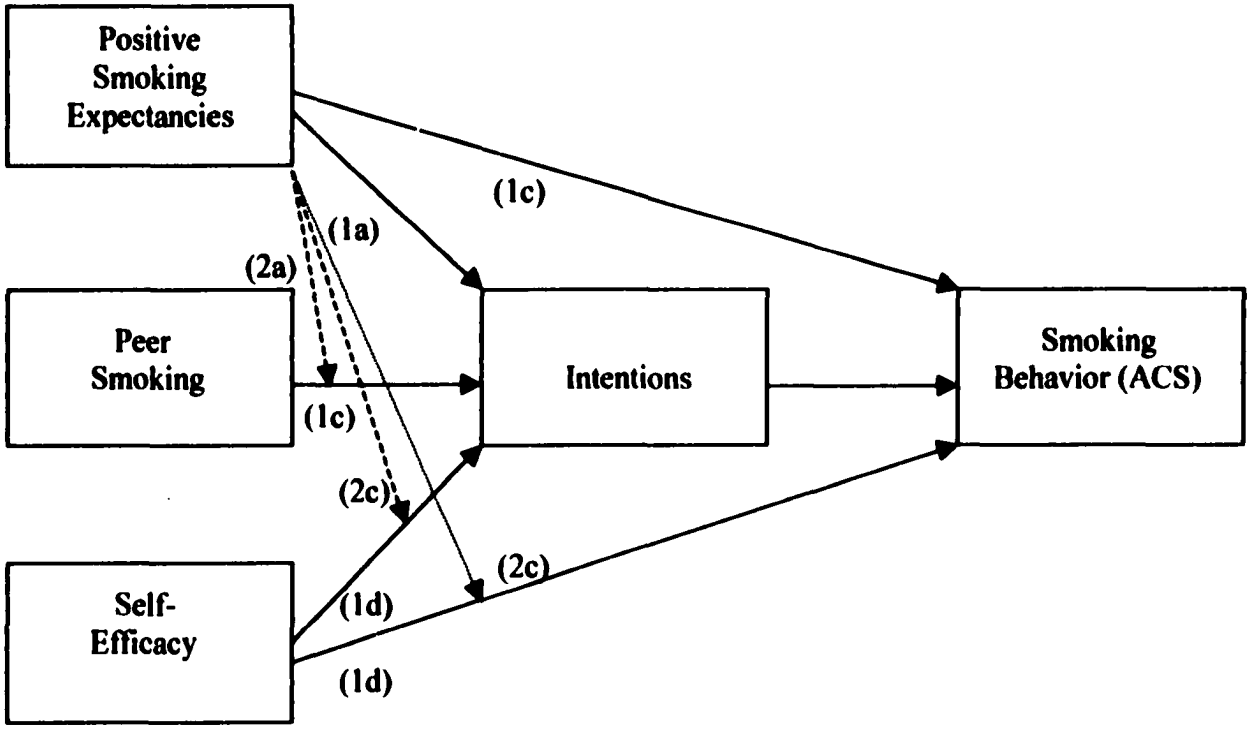


FIGURE 2. The interactional model of positive smoking expectancies with peer smoking and self-efficacy predicting intentions to smoke and smoking behavior, adapted from the theory of planned behavior.



Note: Solid lines indicate additive hypotheses with the corresponding hypothesis number directly below the solid line. Dashed lines indicate moderational hypotheses with the corresponding hypothesis number italicized directly to the left of dashed line.

FIGURE 3. The interaction of positive smoking expectancies with peer smoking predicting intentions to smoke.

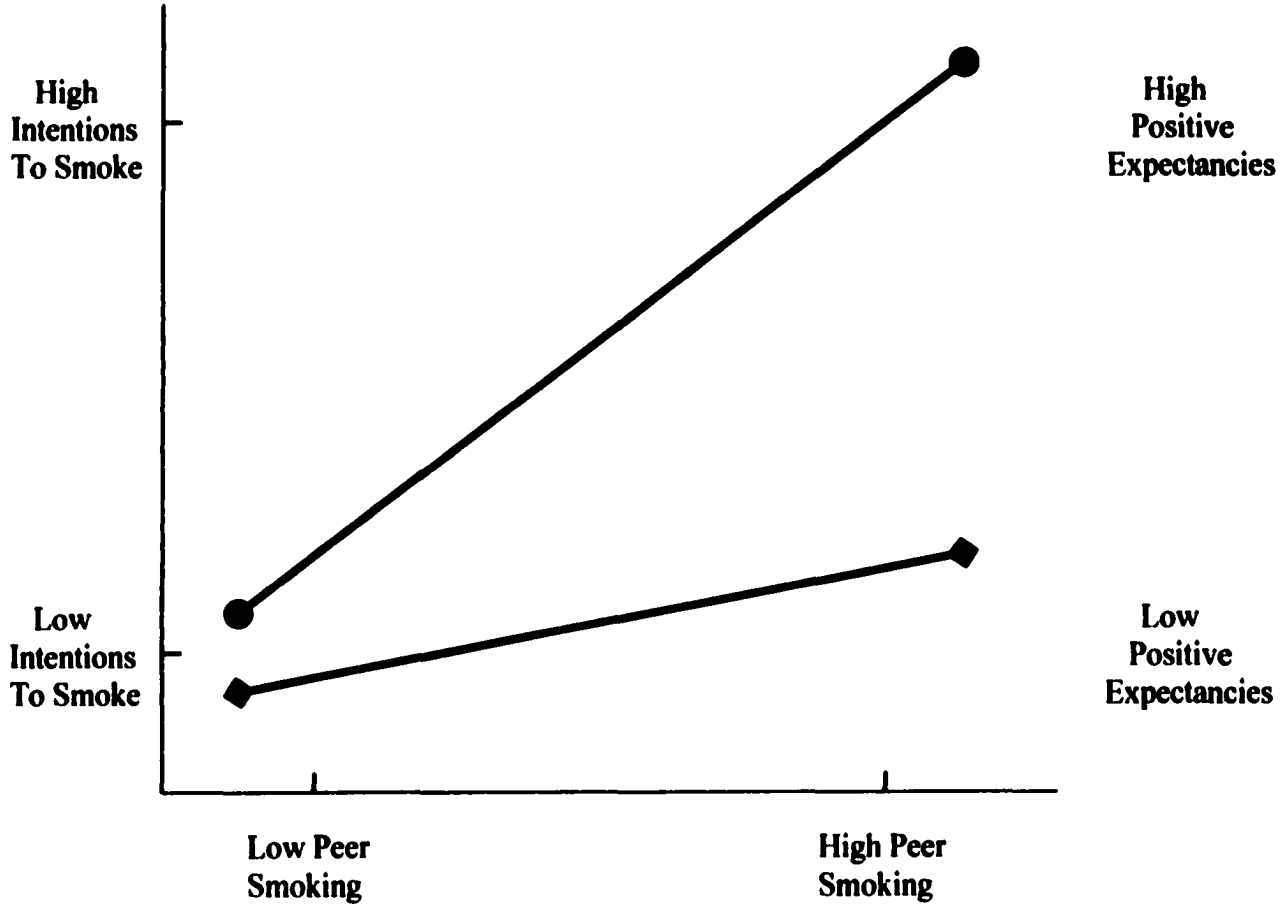


FIGURE 4. The interaction of positive smoking expectancies with self-efficacy predicting intentions to smoke and smoking behavior.

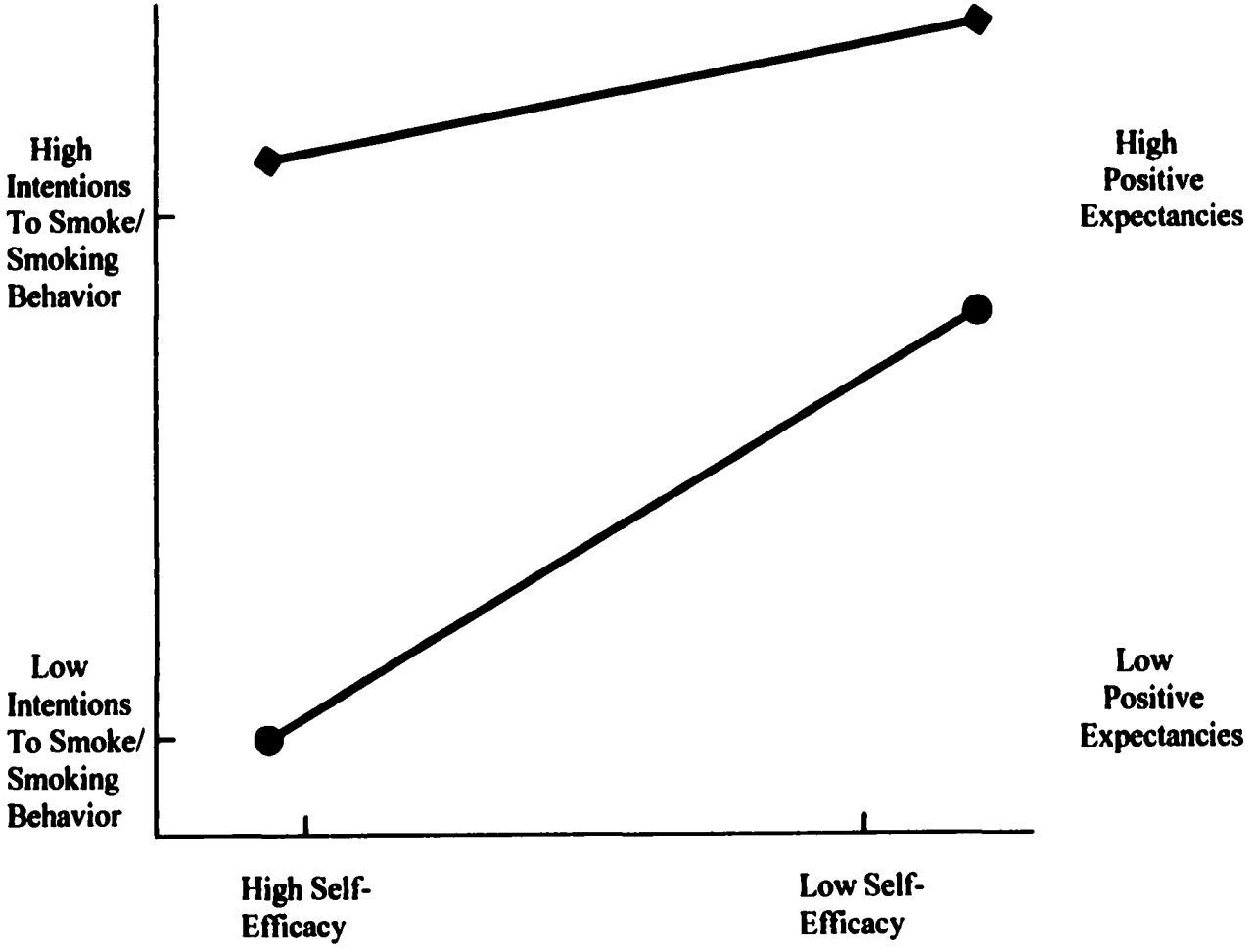
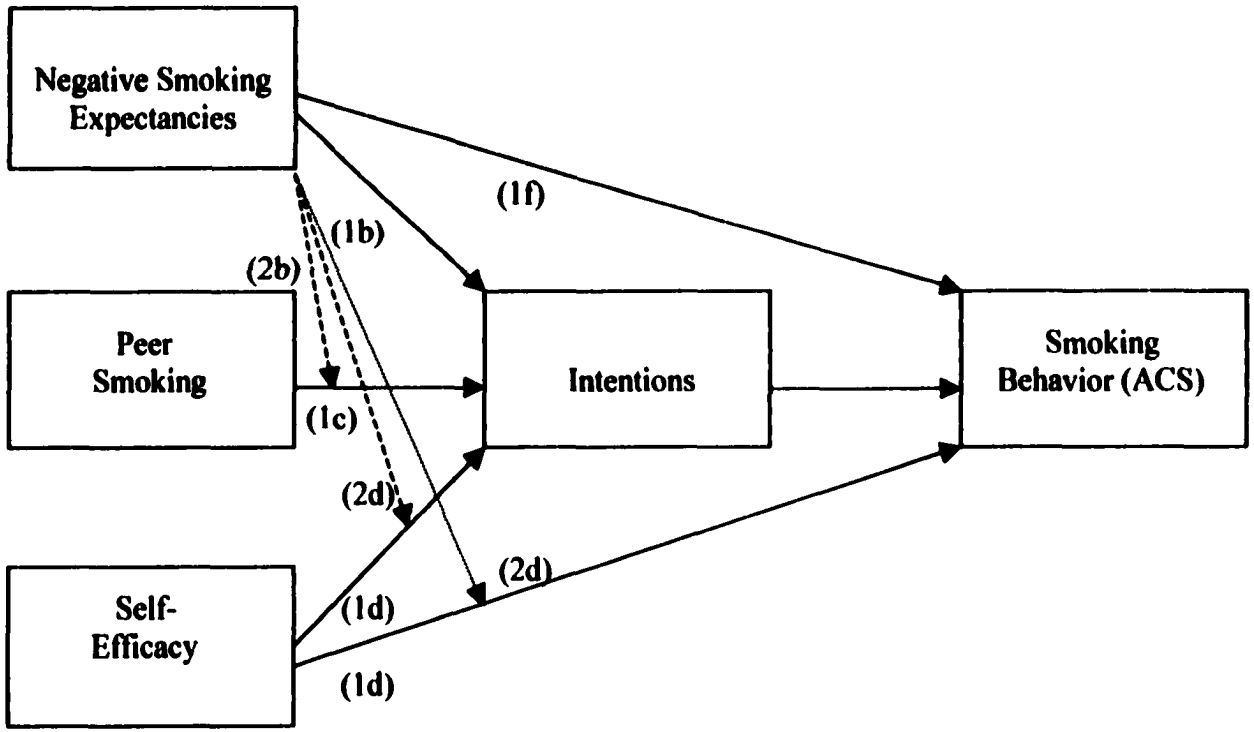


FIGURE 5. The interactional model of negative smoking expectancies with peer smoking and self-efficacy predicting intentions to smoke and smoking behavior.



Note: Solid lines indicate additive hypotheses with the corresponding hypothesis number directly below the solid line. Dashed lines indicate moderational hypotheses with the corresponding hypothesis number italicized directly to the left of dashed line.

FIGURE 6. The interaction of negative smoking expectancies with peer smoking predicting intentions to smoke.

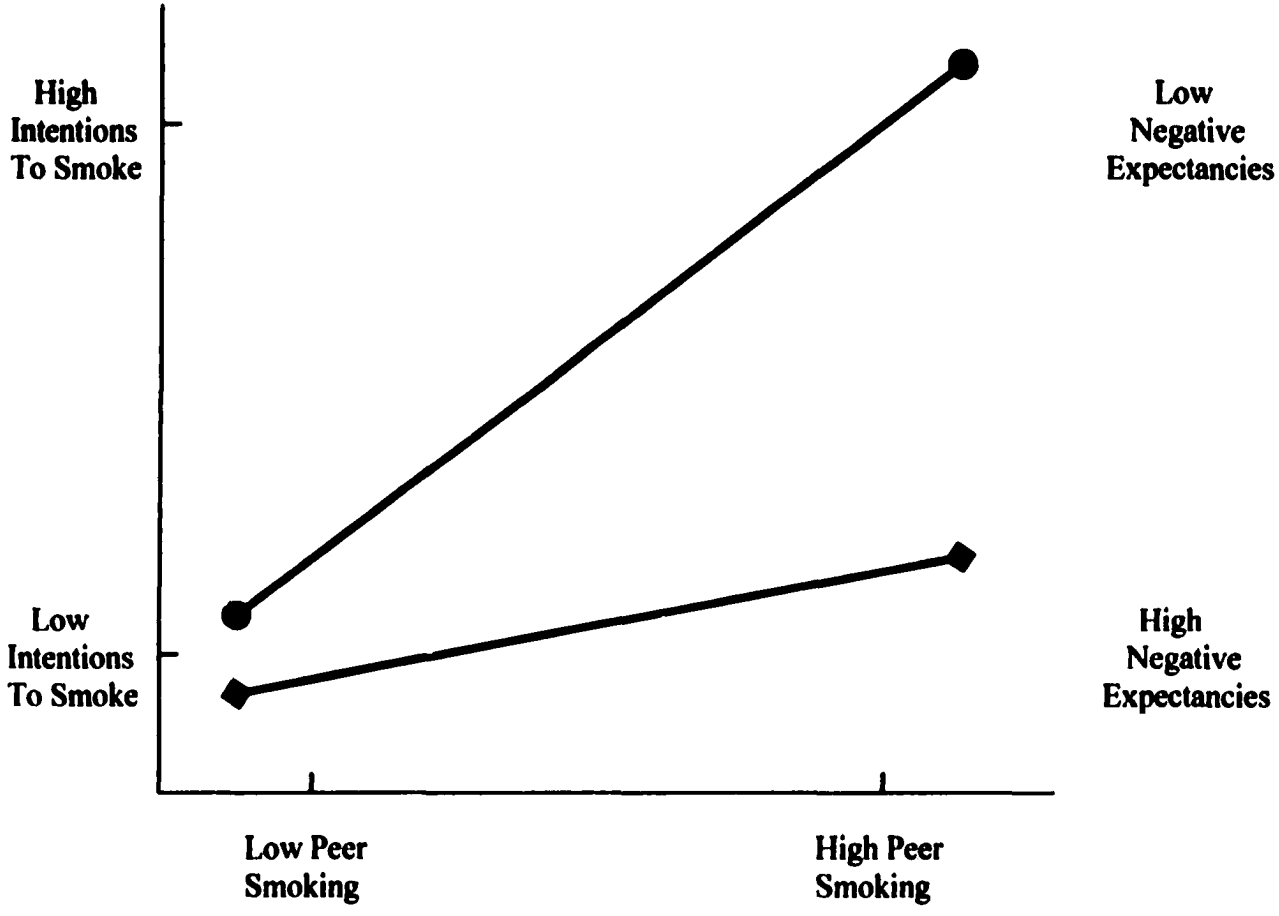


FIGURE 7. The interaction of negative smoking expectancies with self-efficacy predicting intentions to smoke and smoking behavior.

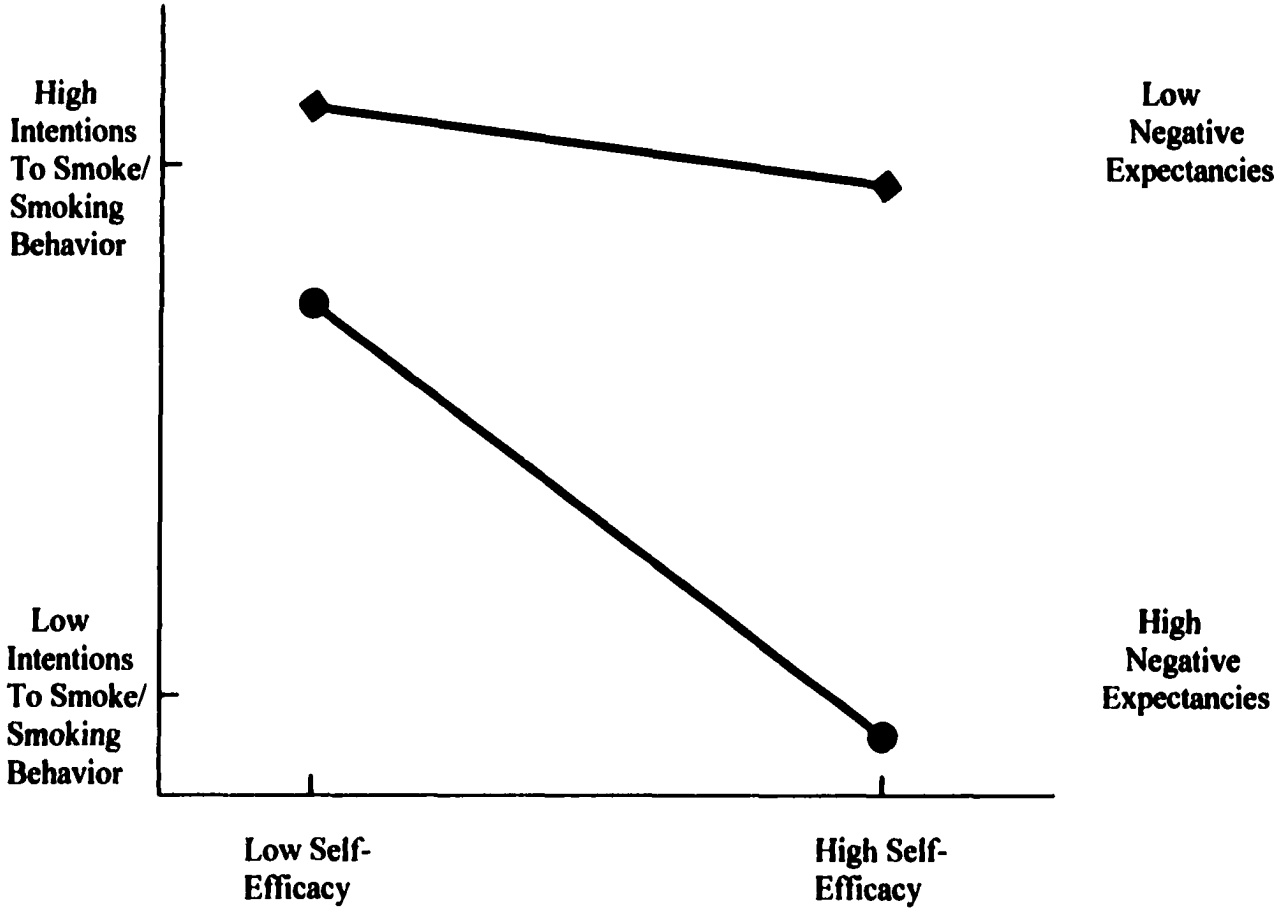


Figure 8. Hierarchical multiple regressions: The interaction of positive smoking expectancies with peer smoking predicting intentions to smoke (Middle school non-smokers).

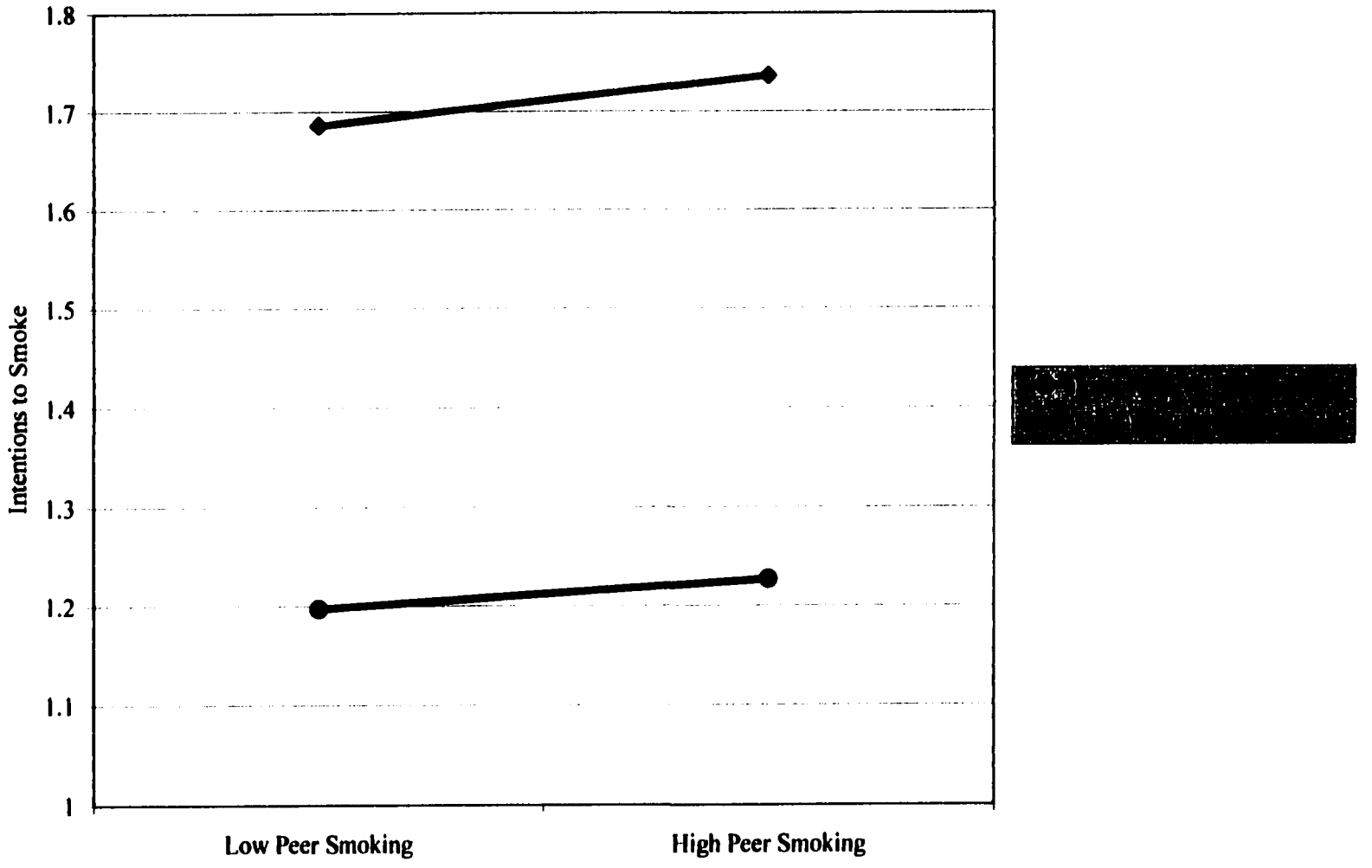


Figure 9. Hierarchical multiple regressions: The interation of positive smoking expectancies with peer smoking predicting intentions to smoke (High school smokers).

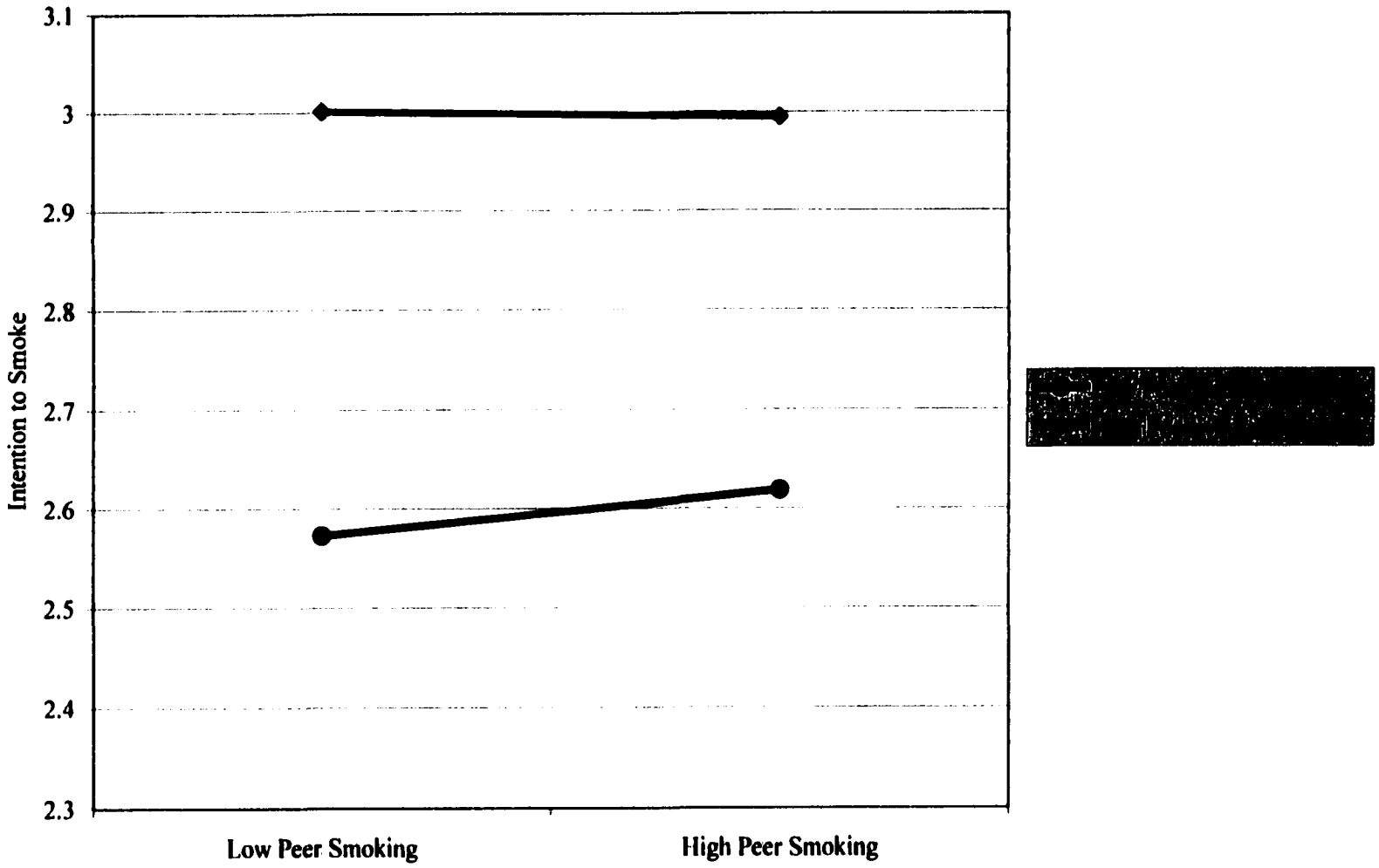


Figure 10. Hierarchical multiple regressions: The interaction of negative smoking expectancies with peer smoking predicting intentions to smoke (Middle school smokers).

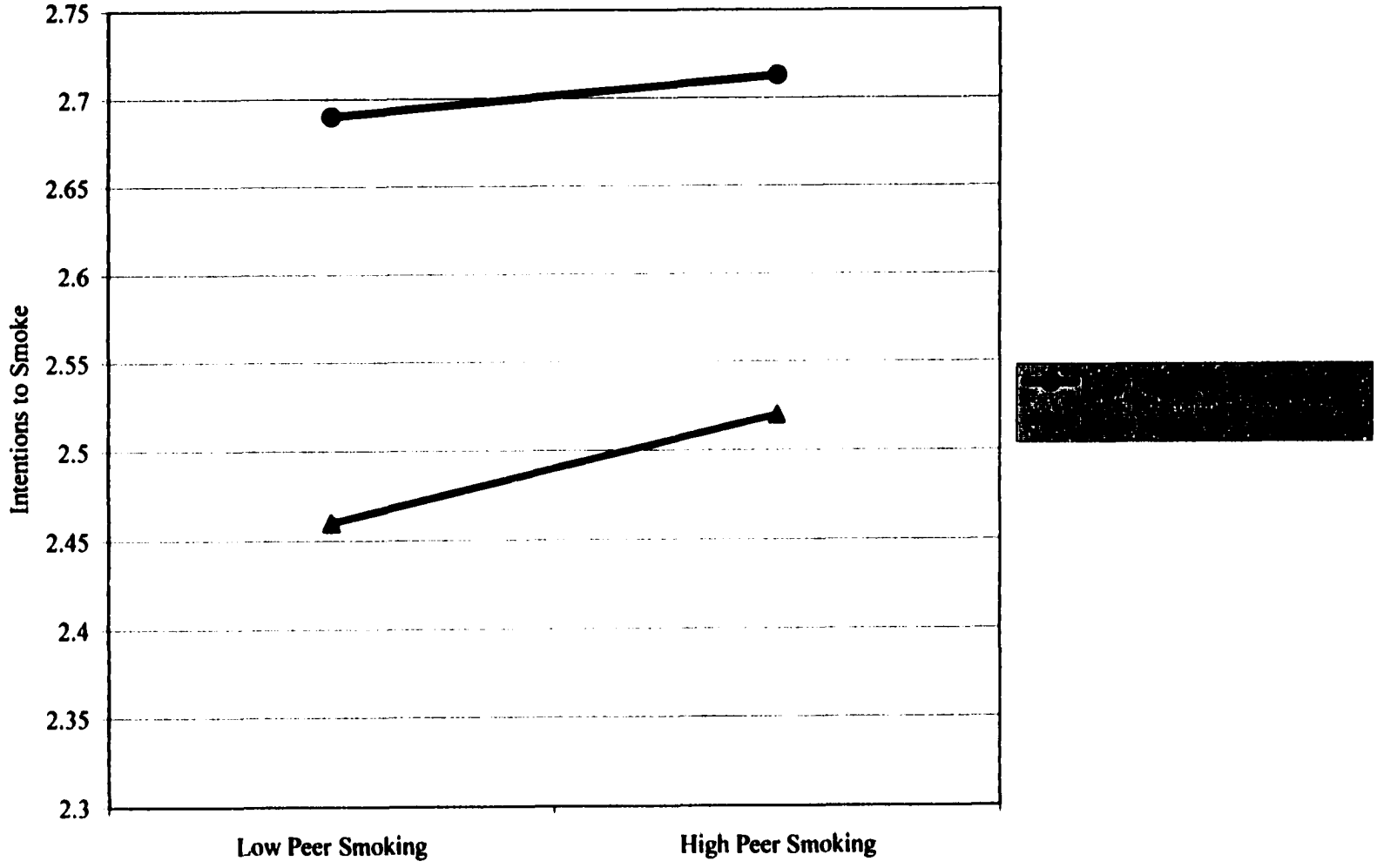


Figure 11. Hierarchical multiple regressions: The interaction of negative smoking expectancies and peer smoking predicting intentions to smoke (High school smokers).

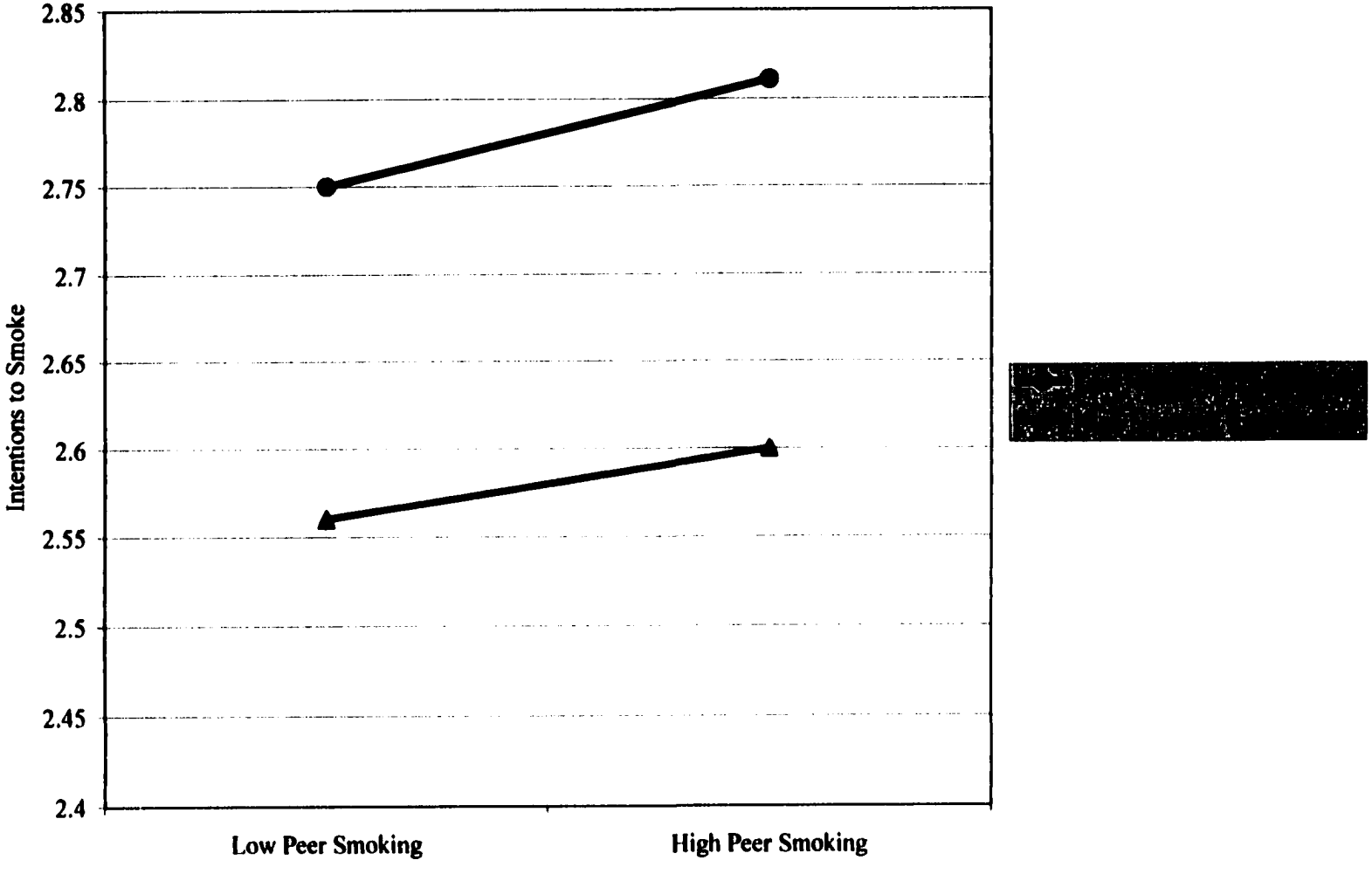


Figure 12. Hierarchical multiple regressions: The interaction of positive smoking expectancies with self-efficacy predicting intentions to smoke (Middle school non-smokers).

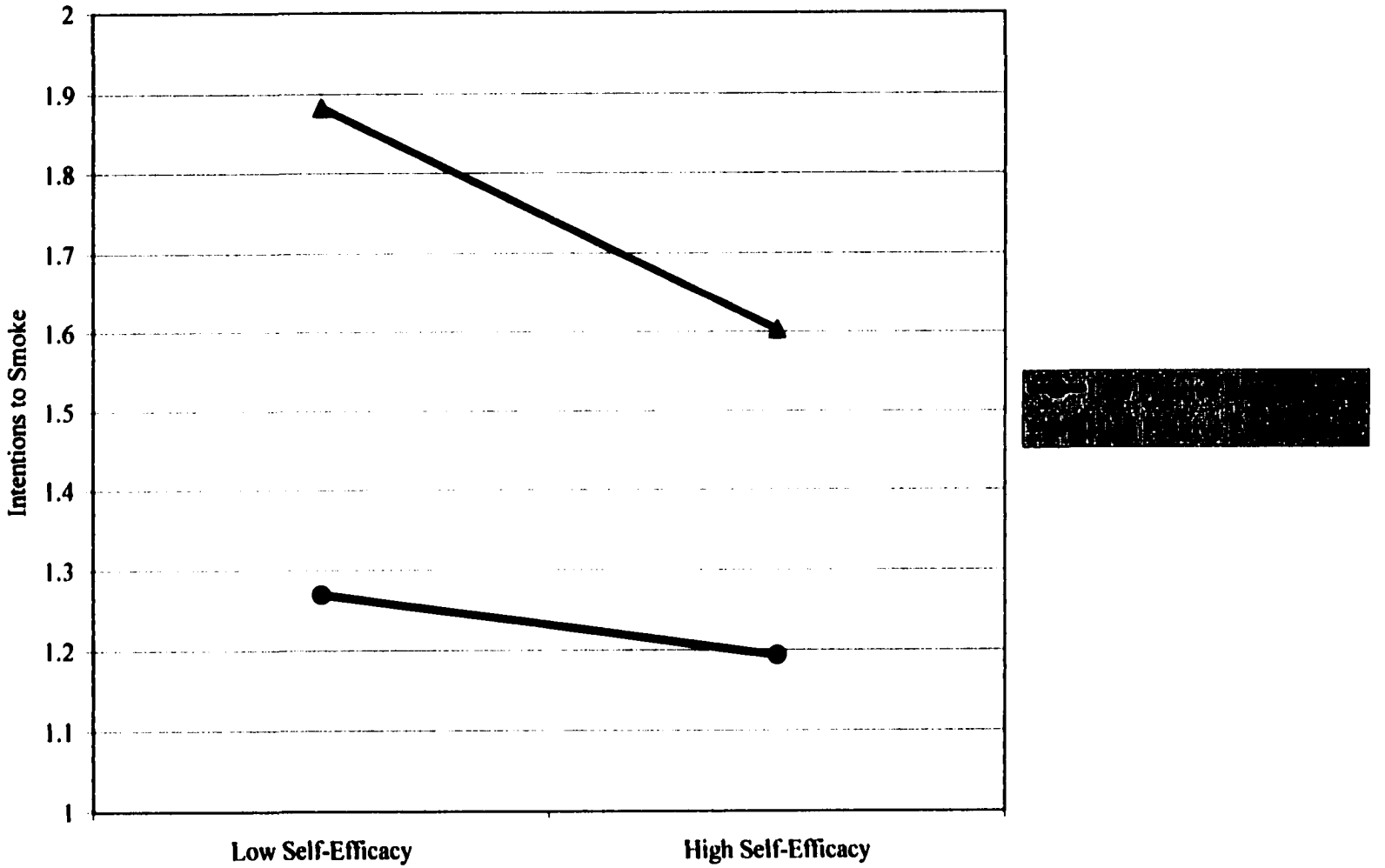


Figure 13. Hierarchical multiple regressions: The interaction of positive smoking expectancies with self-efficacy predicting intentions to smoke (High school non-smokers).

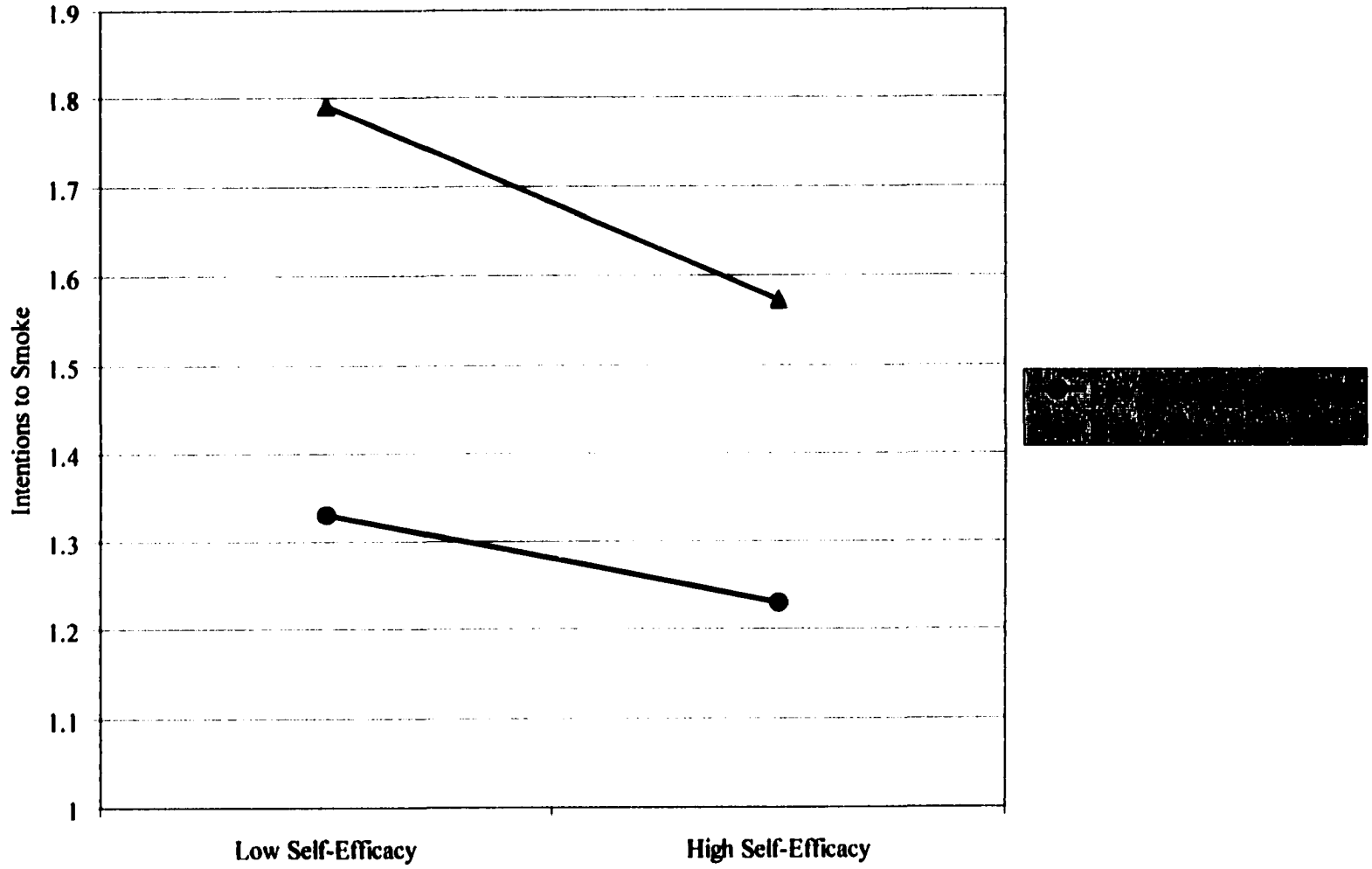


Figure 14. Hierarchical multiple regressions: The interaction of negative smoking expectancies with self-efficacy to abstain from smoking predicting intentions to smoke (Middle school smokers).

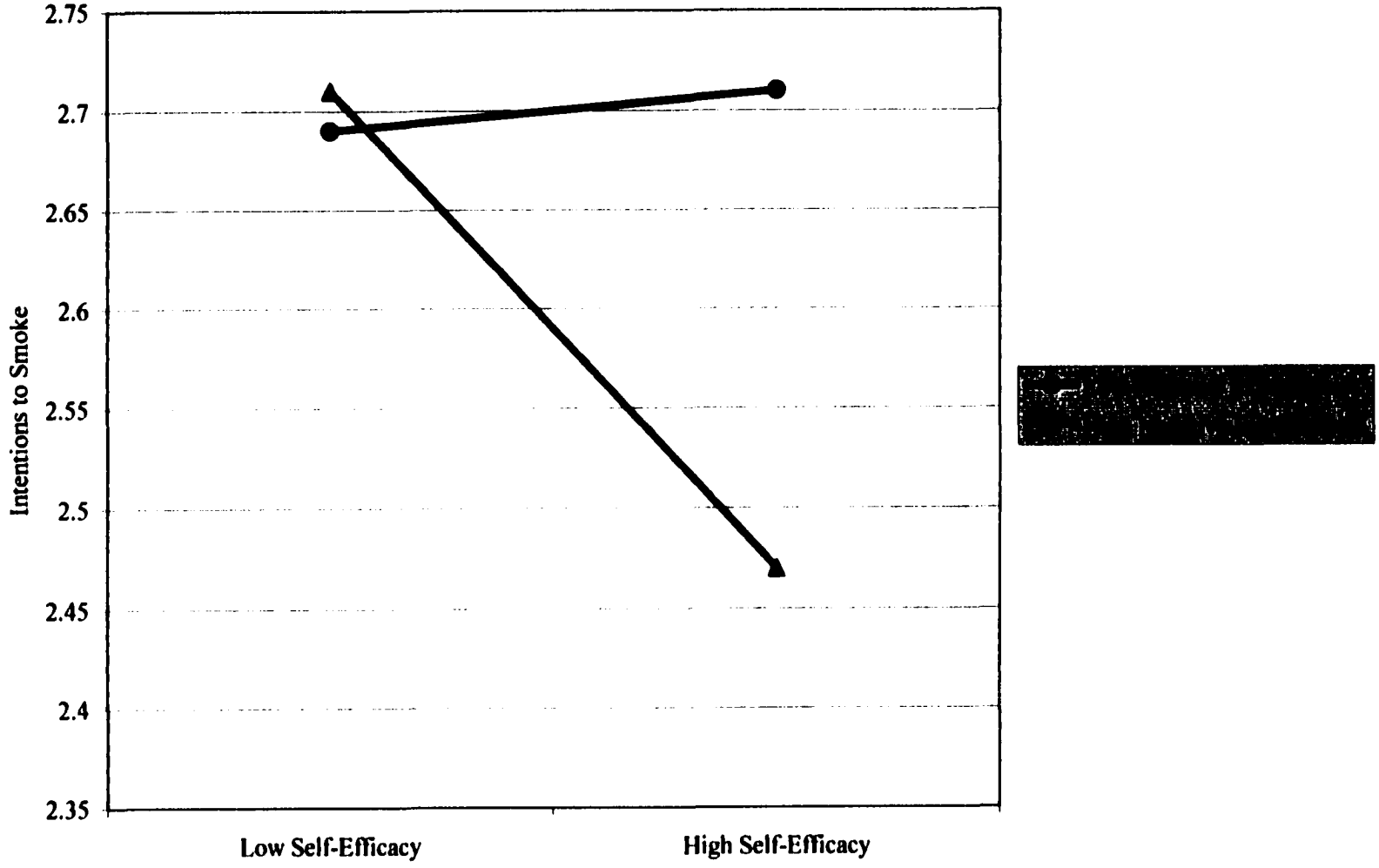


Figure 15. Hierarchical multiple regressions: The interaction of negative smoking expectancies with self-efficacy to abstain from smoking predicting intentions to smoke (Middle school non-smokers).

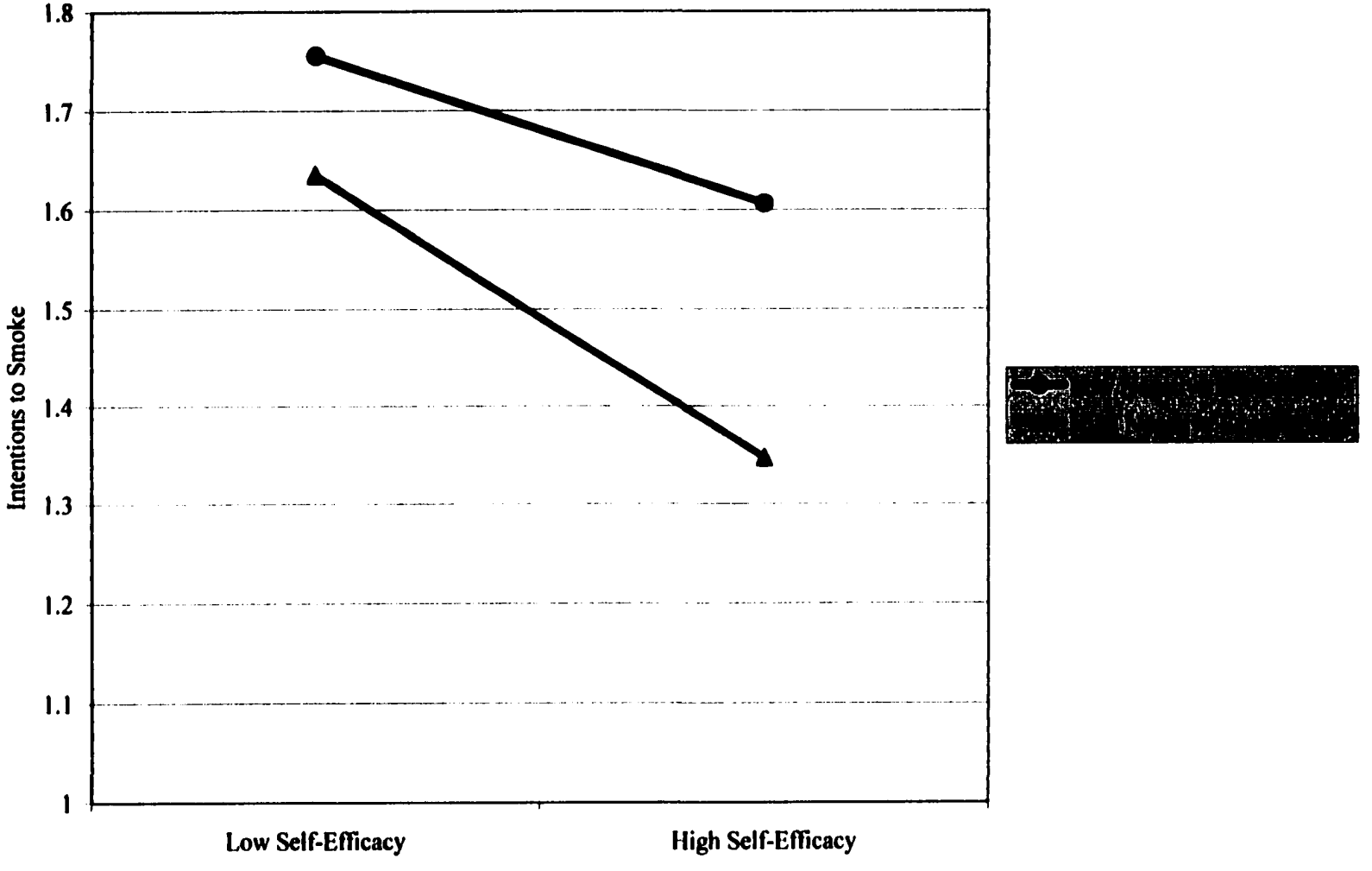


Figure 16. Hierarchical multiple regressions: The interaction of negative smoking expectancies with self-efficacy to abstain from smoking predicting intentions to smoke (High school smokers).

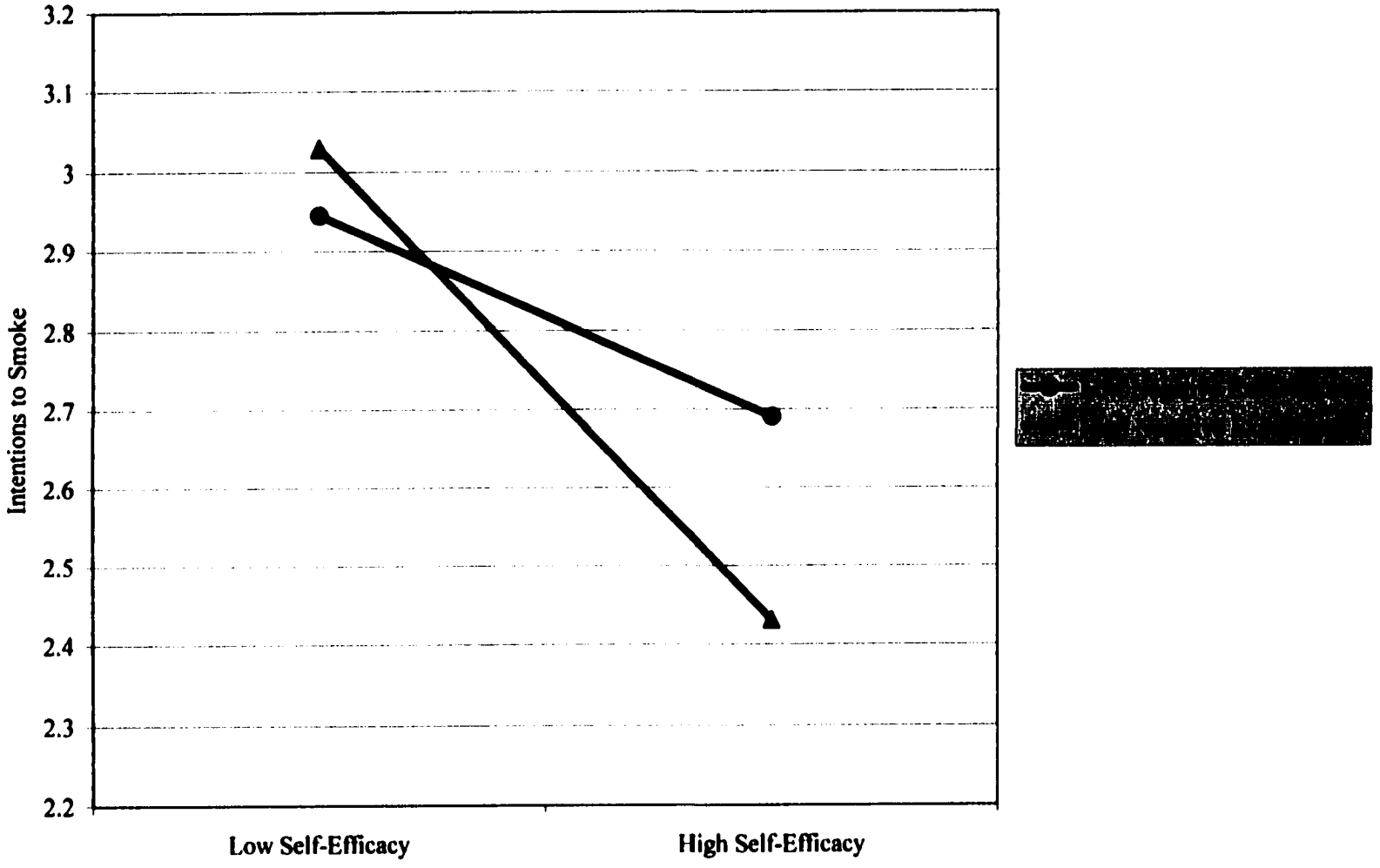


Figure 17. Hierarchical multiple regressions: The interaction of negative smoking expectancies with self-efficacy to abstain from smoking predicting intentions to smoke (High school non-smokers).

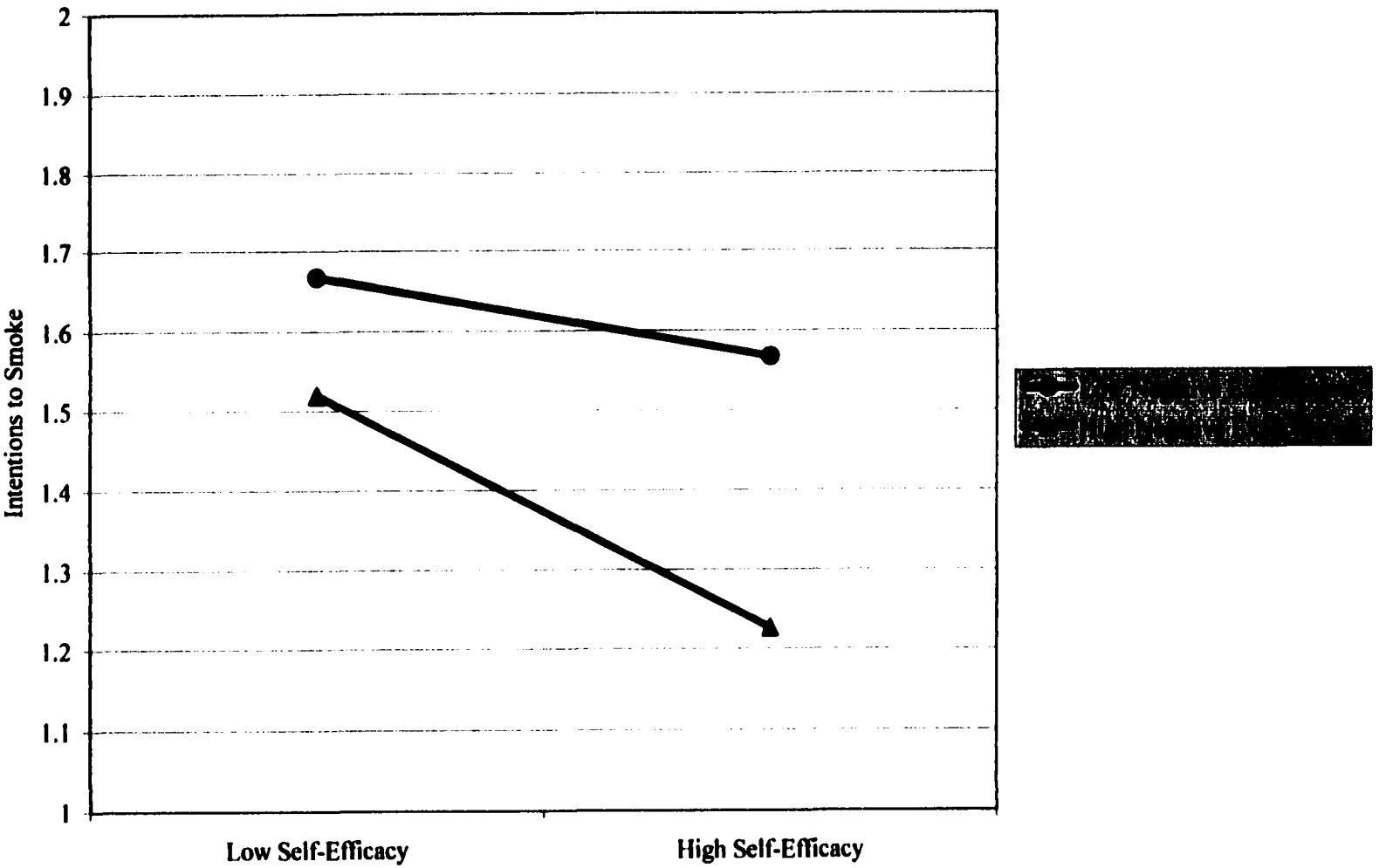


Figure 18. Hierarchical multiple regressions: The interaction of negative smoking expectancies with self-efficacy predicting smoking behavior (Middle school smokers).

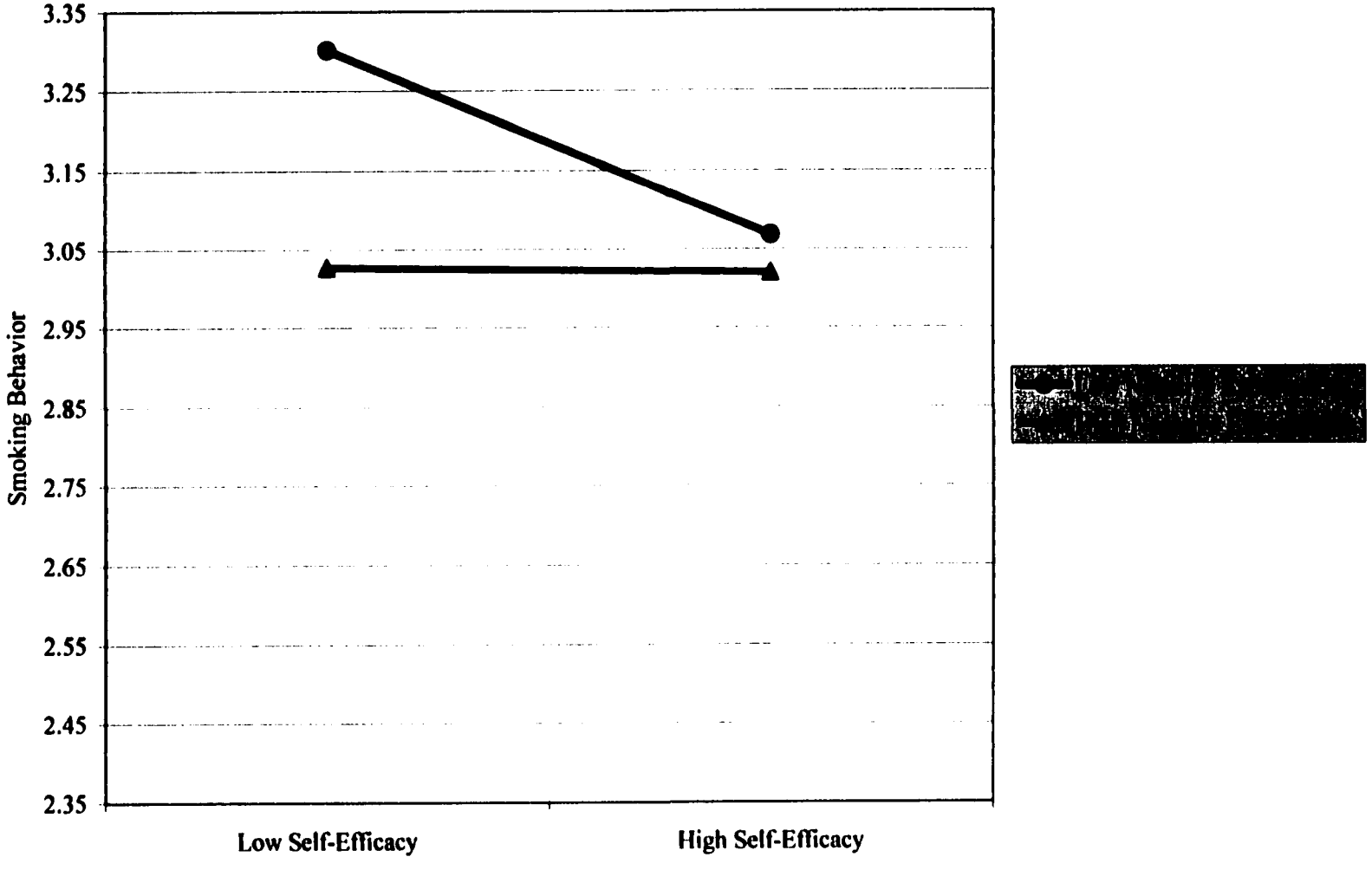
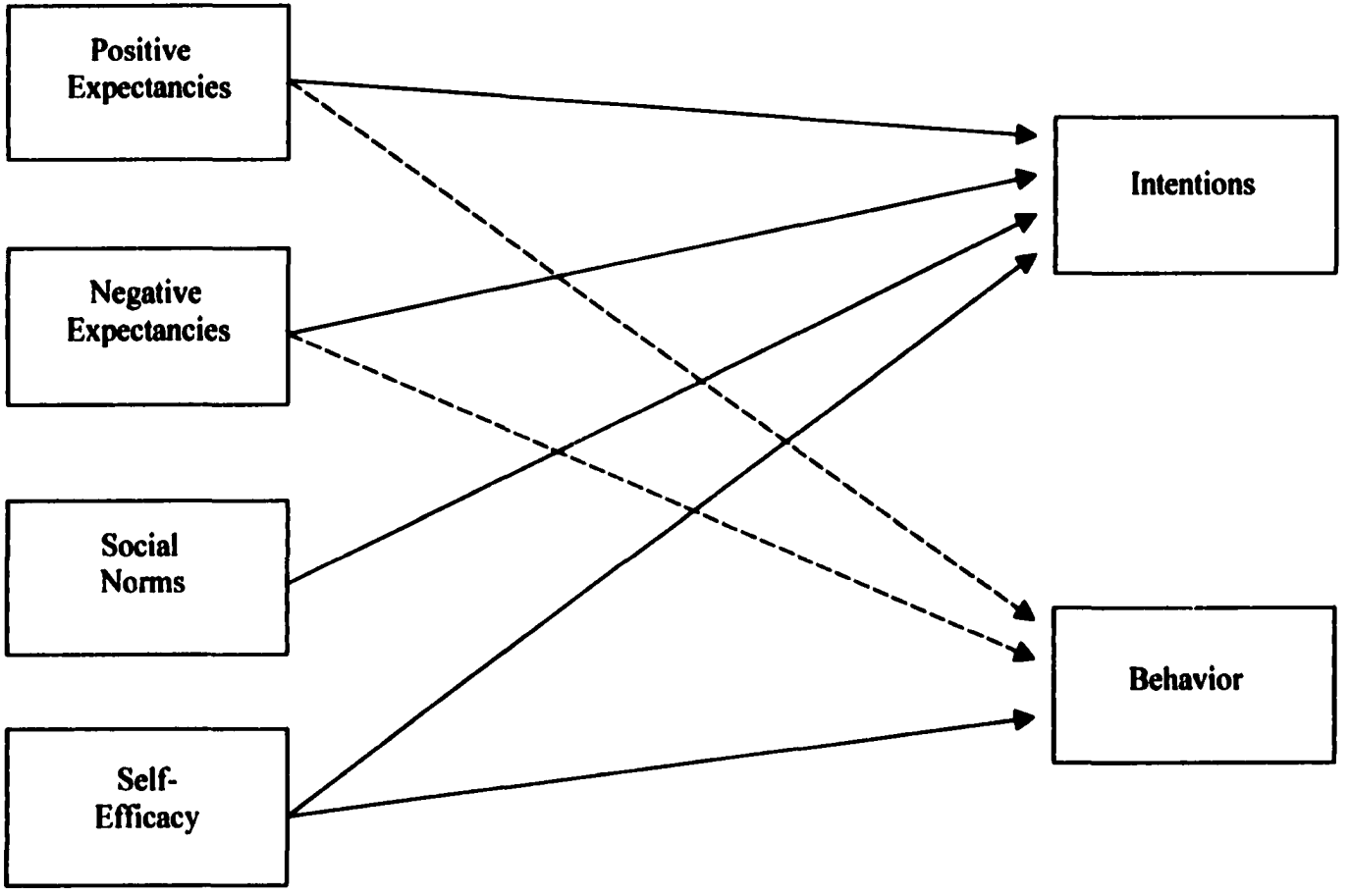
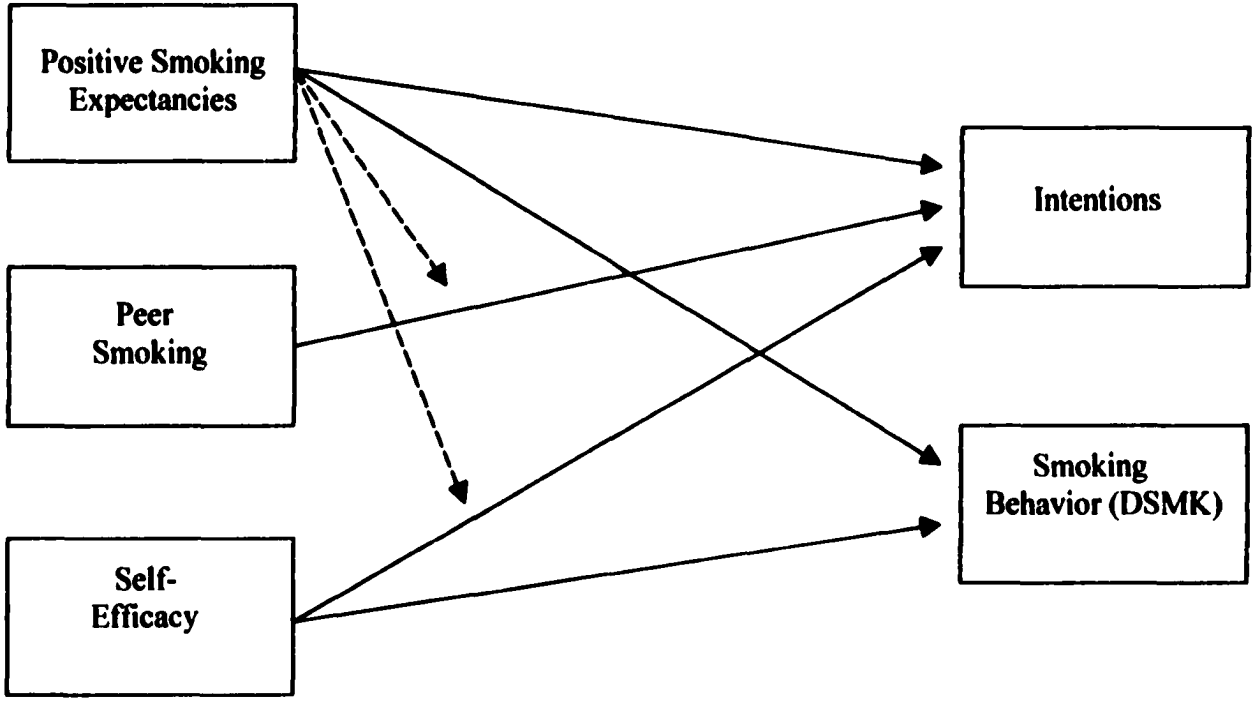


FIGURE 19. The adapted and extended theory of planned behavior: Additive effects.



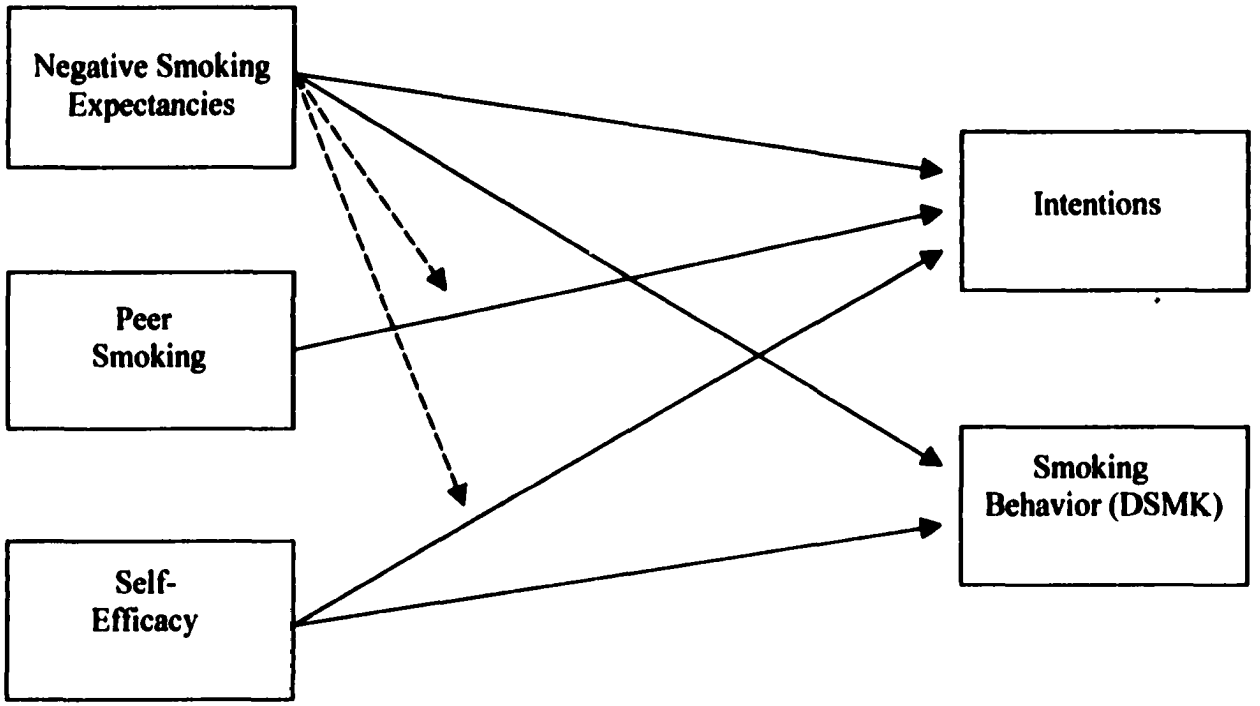
Note: The dashed line represents the adaptation and extension of the theory of planned behavior. Straight lines represent the traditional theory of planned behavior.

FIGURE 20. The interactional model of positive smoking expectancies with peer smoking and self-efficacy predicting intentions to smoke and daily smoking, adapted from the theory of planned behavior.



Note: Solid lines indicate additive relationships. Dashed lines indicate moderational relationships.

FIGURE 21. The interactional model of negative smoking expectancies with peer smoking and self-efficacy predicting intentions to smoke and daily smoking, adapted from the theory of planned behavior.



Note: Solid lines indicate additive relationships. Dashed lines indicate moderational relationships.

Figure 22. Hierarchical multiple regressions: The interaction of negative smoking expectancies with peer smoking predicting intentions to smoke (Middle school smokers).

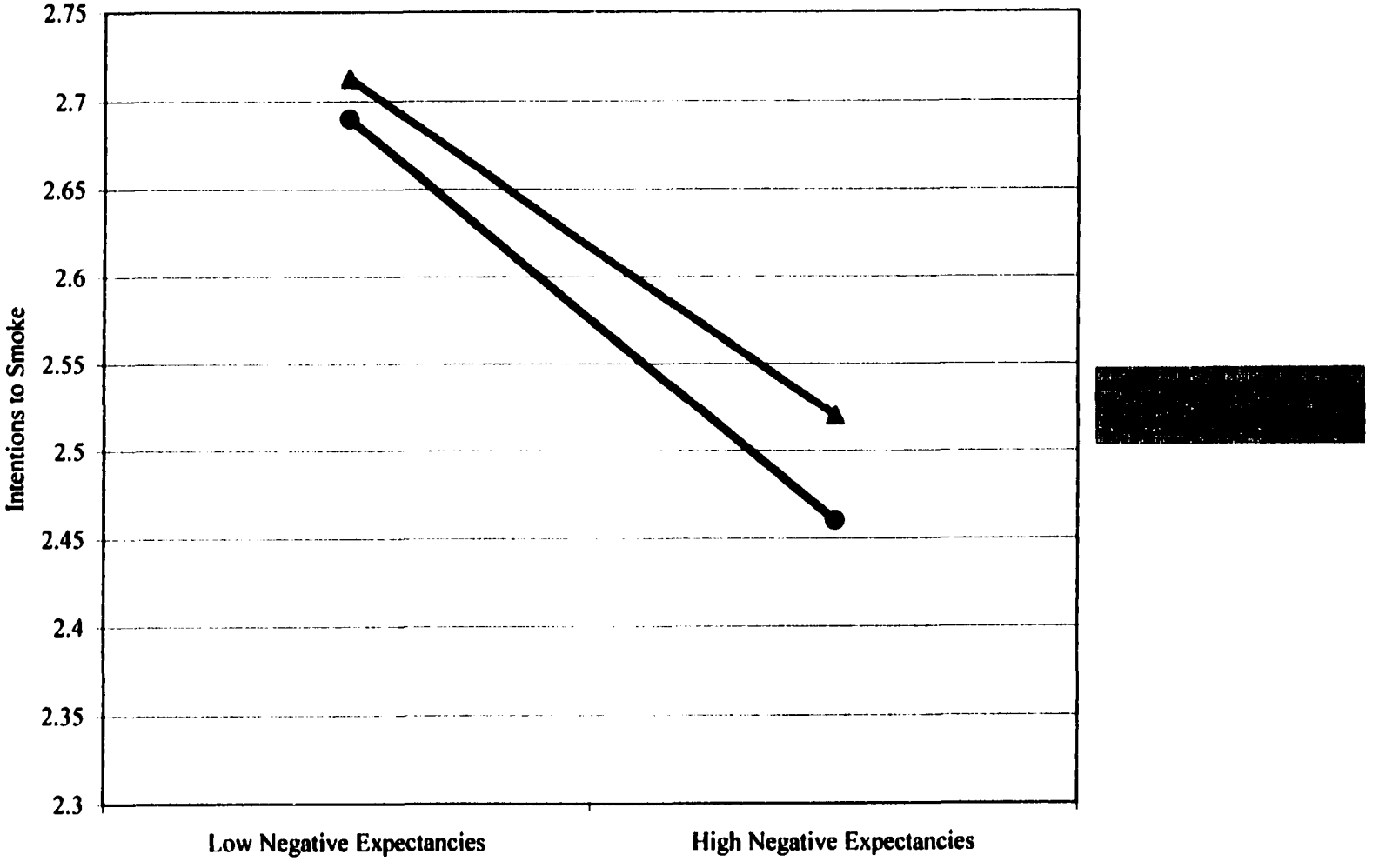


Figure 23. Hierarchical multiple regressions: The interaction of positive smoking expectancies with self-efficacy to abstain from smoking predicting intentions to smoke (High school non-smokers).