INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

UMI®

Bell & Howell Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600

Running head: ADOLESCENT SMOKING BEHAVIORS

An Examination of Predictors Related to the Stages and Transitions of Smoking Behavior in Adolescents

Connie Dalton ©

Master's Thesis

Department of Psychology

Lakehead University

October, 1998

Supervisor: Dr. K. Paul Satinder

Second Reader: Dr. Charles T. Netley

Research for this thesis was supported in-part by Grants to Dr. K. Paul Satinder.

Acknowledgements

First of all, I would like to thank my supervisor, Dr. Paul Satinder, for giving me the opportunity to mature in both a professional and personal sense. His guidance allowed me to develop confidence in my academic skills, and will continue to do so in any of my future endeavors. Secondly, I would like to thank both Dr. Chuck Netley and Professor Ken Allen for the valuable assistance they provided me with. I would also like to acknowledge the caring and support of my family and friends throughout this entire process. I would not have been able to do as well as I did without your help Harjit. Francois, thank-you! Thank-you for your continuous words of encouragement and your constant belief in me.

Table of Content

Abstract

The present study examined adolescent smoking in relation to six different groups of smoking determinants, including: the social environment, pharmacological factors, social bonding, social learning, personality/intrapsychic determinants, and knowledge, belief, attitude, and behavior variables. In order to summarize these constructs, factor analysis was performed on the last four groups of determinants. Longitudinal associations between these predictors and three stages of smoking were assessed separately among adolescents aged 10 to 14 and 15 to 19, and predictors related to three different smoking transitions were also examined. Factor analyses revealed that the predictor variables loaded on three higher order constructs, including: 1) deviance and social influences, 2) beliefs, attitudes, and behavior, and 3) social bonding. Family smoking, social bonding, beliefs, and social norms discriminated between stages of smoking differentially, depending on age. Whereas, social learning variables predicted the transition from non-smoking to initiation best, and increasing consumption among initial and experimental smoking was best predicted by social learning, as well as belief and attitude variables. Normative social influences and pharmacological variables predicted the transition to decreasing consumption among maintenance smokers.

An Examination of Predictors Related to the Stages and Transitions of Smoking Behavior in Adolescents

Cigarette smoking is one of the most significant public health concerns, as it is the single largest preventable cause of premature death in the world, and is also one of the most difficult of the drug dependencies to break (Bartecchi, Mackenzie, & Schrier, 1995; U.S. Surgeon General, 1989). Correspondingly, unlike adult smoking, which has been consistently declining for the past 30 years, the prevalence of adolescent smoking has remained quite stable (Foulds & Godfrey, 1995). In the United States alone there is currently an estimated six million teenagers, and 100,000 children younger than 13 years old who smoke (Bartecchi et al., 1995). Furthermore, smoking prevention (Cleary, Hitchcock, Semmer, Flinchbaugh, & Pinney, 1988) and intervention programs (Chassin, Presson, & Sherman, 1990) for adolescents have shown only short-term success in the past, and have been of limited clinical utility. This is quite disturbing, as exposure to cigarette smoking during adolescence substantially increases the risk of regular and lifetime cigarette smoking in adulthood (Chassin et al., 1990; Cleary et al., 1988; McNeill, 1988).

The present situation may in part be due to the fact that past smoking prevention programs, have been based upon the assumption that the onset of adolescent smoking is a discrete event, which is caused by social influences to smoke. In fact, this is an overly simplistic conceptualization which has been

negated in past research. Current literature suggests that the onset of adolescent smoking is a very complex developmental process (Flay, D'Avernas, Best, Kersell, & Ryan, 1983; Leventhal & Cleary, 1980), involving a significant number of causal factors. Thus, the purpose of the present study was to examine the importance of a large number of smoking predictors during the entire process of becoming a smoker.

The Smoking Acquisition Process.

It has been hypothesized that the adoption of smoking behavior among adolescents involves multiple developmental stages and transitions (Flay et al., 1983). Leventhal and Cleary (1980) proposed four primary stages of smoking onset among adolescents, including: the preparation stage, the initiation stage, the experimentation stage, and the active or maintenance stage. More specifically, the preparation stage of smoking is defined as the period of the smoking acquisition process when an individual has never smoked a cigarette, but observes smoking behaviors around him/her, and anticipates the experience of smoking (Cleary et al., 1988). This observation and anticipation of smoking is proposed to result in the adoption and modification of attitudes toward smoking, which consequently affects future decisions to smoke. Thus, the onset of smoking occurs prior to any initial experimentation with cigarettes (Leventhal & Cleary, 1980). The initiation stage involves the adolescents' use

of their first few cigarettes. During this stage, their early experience with cigarettes and interpretation of these experiences may influence subsequent smoking behavior. Whereas, experimental smoking begins when cigarettes are used on a more regular basis, but is not yet characterized by addiction. At this time the adolescent may stop smoking without much difficulty. On the other hand, the maintenance stage of smoking involves daily cigarette use and addiction, which has resulted from regular smoking over an extended period of time. Correspondingly, three transitions exist between each of the four stages of smoking onset. They include, 1) the transition from never smoking to the initiation of smoking, 2) the transition from initiation to experimentation, and 3) the transition from experimentation to long term maintenance of smoking behavior (Bowen, Dahl, Mann, & Peterson, 1991; Chassin, Presson, Sherman, & Edwards, 1991; Cleary et al., 1988; Hirschman, Leventhal, & Glynn, 1984).

However, the onset of adolescent smoking is not always as straightforward as this model suggests. For example, an individual may go through several cycles of initiation and experimentation, with both increasing and decreasing patterns of cigarette consumption, before they become maintenance smokers or quit smoking entirely (Cleary et al., 1988; 1983; Goddard, 1992). Moreover, the mechanisms involved in each of these transitions, may be entirely different from the mechanisms involved in the others. Factors related to the transition from non-smoking to initiation may be

distinct from the factors related to the transition from initiation to experimentation. In addition, very different causal mechanisms may also be functioning when an adolescent decreases their cigarette consumption.

In order to make sense of the smoking acquisition process, researchers have proposed various stage models of adolescent smoking (Flay et al., 1983). For example, Flay (1992) grouped the determinants of adolescent smoking according to a six factor biopsychosocial model, and clearly attempted to explain the interrelationships and contribution of these determinants throughout the onset process. Specifically, the six domains of determinants within this model consist of the social environment, social bonding, social learning, pharmacological effects, personality/intrapsychic factors, and knowledge, beliefs, attitudes, and behaviors (Flay, 1992). Most importantly, he highlighted the importance of more external determinants (such as social learning) during the initial stages of smoking onset, and of internal influences (such as knowledge, beliefs, and attitudes) during the later stages of smoking onset (Flay, 1992). This model is relevant to the present study in two ways. First, it can be used to categorize the predictors of adolescent smoking, in the present study, in a comprehensive manner. Second, it provides us with a general hypothesis regarding the influence of more external and internal predictors throughout the smoking onset process.

Predictors of Adolescent Smoking.

In the past, research concerned with adolescent smoking was primarily cross sectional and a-theoretical, comparing adolescent non-smokers and smokers on health-related variables and demographic characteristics. However, current research has utilized more methodologically sound research designs, examining the prospective relationships between a variety of different variables and smoking onset among adolescents. This evolution has primarily developed within the context of four social psychological research traditions, including 1) Ajzen and Fishbein's (1980) theory of reasoned action, with smoking occurring as a result of specific attitudes and normative beliefs, 2) Bandura's (1963) social learning theory, with adolescent smoking resulting from more direct and indirect social influence, 3) Jessor and Jessor's (1977) problem behavior theory, with personality and perceived environmental variables leading to a premature transition to adult status and smoking behavior, and 4) smoking resulting from processes related to the expression and enhancement of adolescent self concept (Chassin et al., 1990). As a consequence, a number of variables are currently associated with the onset of smoking among adolescents.

Focusing specifically on longitudinal research from 1980 to 1990, Conrad, Flay, and Hill (1992) reviewed the determinants of smoking onset, and confirmed the importance of many well-accepted predictors. Among these predictors, those which were most consistently related to the onset of smoking

are examined within the present study, and are also organized according to the six domains of determinants suggested by Conrad et al. (1992).

Social Environment. Different variables within the social environment have been found to influence the onset of smoking among adolescents. Of these, an individual's gender and age are probably the most consistently predictive. Males and females have been repeatedly found to initiate smoking at different times of their lives and for different reasons (Berg-Kelly, 1995; Chassin, Presson, Sherman, & Mulvenon, 1994; Del Rio & Alvarez, 1994; Fiegelman & Lee, 1995; Goddard, 1992; McNeill et al., 1988; Santi, Brown, Best, & Cargo, 1991). Accordingly, older age (McNeill et al., 1988), and the initiation of smoking at earlier ages (Breslau & Peterson, 1996; Chassin & Presson, 1990) has also been found to predict smoking onset among adolescents.

Researchers have also suggested that the importance of different smoking predictors is dependent upon the developmental age of the adolescent (Conrad et al., 1992). For instance, Chassin, Presson, Sherman, Corty, & Olshavsky (1984) reported that peer models of smoking were more predictive of smoking behavior for high-school students and less so for middle-school students, while personality and perceived environmental variables were more important for middle-school students than for high-school students. While, Stein, Newcomb, and Bentler (1996) indicated that smoking was associated

with positive social relations, extroversion, and cheerfulness during junior high school, but less so at later ages, when smoking was more related to depression. Correspondingly, Chassin et al. (1991) found that beliefs regarding the negative social consequences of smoking, academic success, and independence were related to adolescent onset of smoking but not young adult onset, whereas beliefs regarding the health consequences of smoking was more predictive of smoking onset among young adults and not adolescents.

Social Bonding. Social bonding is proposed to be particularly important for an adolescent's self-development and individuation (Foxcroft & Lowe, 1995; McCubbin, Needle, & Wilson, 1985). For example, low environmental support may result in the demoralization of an adolescent, and a greater need for self-definition. Thus, an adolescent may begin to define themselves in a more deviant fashion, and as a consequence adopt more adult-like behaviors, such as smoking (Cleary et al., 1988; Jessor & Jessor, 1977; Klesges & Robinson, 1995).

Parental support (Brunswick & Messri, 1984; Kafka & London, 1991), parental strictness (Chassin et al., 1991), parental monitoring (Biglan, Duncan, Ary, & Smolkowski, 1995), and communication with a parent (Biglan et al., 1995) have been associated with a decreased risk for smoking onset among adolescents. Whereas, adolescents with a greater number of friends (Vicary &

Lerner, 1983), who are closer to their friends (Conrad et al., 1992), who have a more active social life (Vicary and Lerner, 1983), and have a boyfriend or girlfriend (McNeill et al., 1988) have been found to be at an increased risk for smoking onset. In addition, a lower level of commitment and satisfaction to school (Conrad et al., 1992), lower academic expectations (Benson & Donahue, 1989; Botvin, Epstein, Schinke, & Diaz, 1994; Goddard, 1992), problems with school functioning (Vicary & Lerner, 1983), and truancy (Conrad et al., 1992) have also been associated with smoking onset.

Social Learning. Social influences are hypothesized to exert an effect on the thoughts, feelings, and actions of others, both indirectly from learning and directly from pressure, as part of a socialization process (Bandura, 1963; DeVries, Backbier, Kok, & Dijkstra, 1995). Consequently, it is proposed that the reciprocal interaction between an individual and both objective and perceived models of smoking, influences the future adoption of smoking behaviors (Chassin et al., 1990; Cleary et al., 1988; Gordon, 1986; & Klesges et al., 1995). For example, parental smoking (Biglan et al., 1995; Charlton & Blair, 1989; DeVries et al., 1995), sibling smoking (DeVries et al., 1995; Goddard, 1992; Santi et al., 1991), and peer smoking (Bauman & Ennett, 1996; Biglan et al., 1995; Botvin et al., 1994; DeVries et al., 1995) have consistently been associated with the onset of adolescent smoking. Correspondingly, friends

and other adult approval of smoking (Conrad et al., 1992), as well as teachers approval of smoking (McNeill et al., 1988) have also been associated with smoking onset in the past.

Furthermore, higher prevalence estimates of smoking among peers (Botvin et al., 1994; Gerber & Newman, 1989), adults (Conrad et al., 1992), and lower estimates of smoking among teachers (McNeill et al., 1988), as well as receptivity to tobacco advertising (Evans et al., 1995) and cigarette brand awareness (Charlton & Blair, 1989), have been related to an increased susceptibility for adolescent smoking onset. Conrad et al (1992) found that the general availability of cigarettes and offers for cigarettes in general, and from siblings and parents specifically, increased the risk of adolescent initiation of smoking. However, no studies they reviewed examined the relationship between friends' offers for cigarettes and smoking onset (Conrad et al., 1992).

Pharmacological Factors. There is a large body of evidence which suggests that regular adult smoking is mainly due to physiological dependence on nicotine. However, the pharmacological precipitators of smoking behavior among adolescent populations have not been examined extensively in the past. This is largely due to the fact that, most research within this field has been concerned with the prevention of adolescent smoking onset, and not cessation. Despite this, more current research has indicated an association between

smoking onset among adolescents and nicotine dependence (Stanton, 1995; Prokhorov, Pallonen, Fava, Ding, & Niaura, 1996).

Personality/Intrapsychic Determinants. Adolescent problem behaviors such as smoking, are proposed to be the result of a premature transition to adult status, which is partly the result of an individual's personality (Jessor & Jessor, 1977). More clearly, it is hypothesized that the personality characteristics of adolescents may make them more or less susceptible to social influences to smoke (Botvin et al., 1994). For example, adolescents who take more risks (Bowen et al., 1991; Hirschmann et al., 1984; Klesges et al., 1995), who have low refusal skills efficacy (Botvin et al., 1994, De Vries et al., 1995), and suffer from low self-esteem (Conrad et al., 1992; Vicary & Lerner, 1983) have been found to be at an increased risk for smoking onset.

Knowledge, Beliefs, Attitudes, and Behaviors. According to theorists, the use of cigarettes is conceptualized as a reasoned action, which is based on an individual's knowledge, beliefs, and attitudes towards smoking (Ajzen & Fishbein, 1980). Consequently, adolescents' attitudes and normative beliefs are hypothesized to predict both present smoking behavior, and intentions to smoke in the future (Chassin et al., 1990). Moreover, direct experience with smoking will strengthen the consistency between attitudes and behavior, as attitudes

based upon experience become more accessible and stable. Whereas, attitudes will be less stable and less accessible for an individual who has no prior experience with smoking (Chassin et al., 1990).

More positive beliefs and personalized health risk assessments (Charlton & Blair, 1989; Goddard, 1992), and the absence of negative attitudes towards smoking (DeVries et al, 1995; Gerber & Newman, 1989) have predicted smoking onset among adolescents in the past. Moreover, smoking intentions (DeVries et al 1995; & Goddard, 1992) and being uncertain about smoking in the future (McNeill et al., 1988), have also been associated with adolescent smoking onset. Whereas, health knowledge has not been found to be predictive of smoking initiation (Charlton & Blair, 1989). Direct experience and prior experimentation with smoking (DeVries et al., 1988; Gordon, 1986; McNeill et al., 1988), and alcohol (Conrad et al., 1992; McNeill et al., 1988), as well as general substance abuse (Conrad et al., 1992), have also been found to increase the likelihood of future smoking behavior.

Research Examining the Antecedents of the Smoking Acquisition Process.

To our knowledge, most studies which have examined the relationship between smoking predictors and the different stages of the smoking acquisition process, have been cross sectional and have examined a limited number of predictor variables. Similarly, longitudinal studies which have specifically

examined predictors related to the transition from one stage of smoking to the next, have restricted the number of variables they have investigated, and have examined only one or two of these transitions at a time (Bowen et al., 1991; Gordon, 1986; Hirschman et al., 1984; Gerber & Newman, 1989; McCubbin & Wilson, 1985; Krohn, Skinner, Massey, & Akers, 1985). Of the studies reviewed, only two examined the smoking acquisition process in a more comprehensive manner (Chassin, Presson, & Sherman, 1984; Chassin, Presson, Sherman et al., 1984).

Chassin et al. (1984) examined variables, which functioned as antecedents and consequences of the transitions from never smoking to initiation of smoking, and from the initiation of smoking to regular smoking, utilizing a sequential cohort design. They examined five different groups of social environmental predictors among adolescents aged 12 to 17: parent and peer smoking, parent and peer attitudes towards smoking, motivation to comply with parents and peers, parent and peer support and strictness, and deviance proneness. Results suggested that, in general, adolescents who increased their smoking had more peer and parent smoking models, had parents and peers who were relatively less disapproving of smoking, and had friends with less strict standards of good behavior than did ones who decreased their smoking status.

More specifically, they found that parent and peer attitudes were related to the onset of smoking, but not the later establishment of regular smoking.

Whereas, perceived peer strictness was related to the transition from initiation of smoking to regular smoking, but not the transition from never smoking to initiation. Furthermore, never smokers who tried cigarette smoking at Phase 2, consequently increased their number of friends who smoked and their motivation to comply with their friends, while participants who began to smoke regularly declined in their level of perceived parental support. The authors concluded that although adolescence is a period of peer orientation, parental influences are still important, and that smoking consequently moves the adolescent further in the direction of deviance proneness.

Accordingly, Chassin, Presson, Sherman et al. (1984) examined the relationship between three sets of variables, and the transitions from never to experimental smoking and from experimental to regular smoking, among 2,818 seventh and eight graders, across age and sex. The three sets of variables included: Ajzen and Fishbein's (1980) attitude and normative belief variables, Bandura's (1963) smoking environment variables, and Jessor and Jessor's (1977) personality and perceived environment variables. In general, results suggested that all three groups of psychosocial variables predicted the transitions from never to experimental smoking, and from experimental to regular smoking.

More precisely, they found that the transition from never to experimental smoking was best predicted by personality and actual or perceived

smoking environment variables, while the transition from experimental to regular smoking was best predicted by attitudes, beliefs, and intentions to smoke in the future. Results also revealed that peer models of smoking were more predictive of the transition from never to experimental smoking for high-school students, and less so for middle-school students. Whereas, personality and perceived environmental variables were better predictors of increased consumption among triers, for middle-school students and less so for high-school students. The authors concluded that an adolescents decision to initiate smoking is more dependent on a combination of a deviance prone personality and the social environment, while an adolescents' decision to continue smoking is based on more stable attitudes and beliefs that have been established through prior experience.

While confirming the importance of research related to the transitions within the smoking acquisition process, the previous studies reviewed did have limitations. First of all, a number of predictors related to the onset of smoking, and biological antecedents of smoking in particular, were not examined in either of these studies. Secondly, the importance of smoking predictors for different age groups of adolescents was not adequately assessed. While, Chassin, Presson, Sherman et al. (1984) did assess the importance of a large group of predictors for transitions among middle-school and high-school students separately, they only included 12 and 13 year old adolescents in their sample.

The Present Study

The lack of success associated with smoking prevention programs for adolescents in the past, may partly result from theoretically and methodologically flawed research on adolescent smoking. For example, few investigators have included assessments of scale properties or factor analysis within their studies. Correspondingly, many predictors related to the smoking onset process have not been examined within the same study, making it difficult to interpret patterns of results across different studies (Conrad et al., 1992). While past research has primarily focused on the antecedents of adolescent smoking onset in general, the developmental process of becoming a smoker and the differential importance of smoking predictors for different age groups of adolescents, have been virtually ignored in the past (Conrad et al., 1992).

The present study attempted to overcome these limitations by examining a fairly comprehensive group of variables found to predict smoking onset in the past. The discriminating value of these predictors was assessed among adolescents ranging from the ages of 10 to 19. More specifically, six different groups of smoking predictors were examined in the present study, including 1) the social environment, 2) pharmacological factors, 3) social learning , 4) social bonding, 5) personality/ intrapsychic variables, and 6) knowledge, beliefs, attitudes, and behaviors. Factor analysis was performed on the last four groups of predictors, in order to assess their underlying constructs. Predictors

which discriminated non-smokers, initiators, and experimental smokers were examined for two different developmental age groups: 1) from ages 10 to 14 years, and 2) ages 15 to 19 years. These age groups were chosen due to the fact that they split our sample of adolescents almost in half, and conceptually represent a younger and older group of adolescents well (Table 1). Correspondingly, predictors associated with three different smoking transitions were also investigated, and include the transitions from 1) never use to initiation, 2) initiation and experimentation to increasing consumption, and 3) maintenance smoking to decreased cigarette consumption. Due to restrictions in sample size, transitions from initiation to experimentation and from experimentation to maintenance smoking, could not be examined separately.

In summary, the present study attempted to clarify three issues utilizing a biopsychosocial approach: 1) which of the predictors are assessing similar and different constructs, 2) which variables best discriminate between the stages of smoking onset for age groups 10 to 14 years and 15 to 19 years, and 3) which predictors are most important during each transition within the smoking acquisition process, i.e., do external variables predict transitions during the early stages of smoking behavior, while internal variables predict the later transitions?

Method

Participants

Students were recruited from grades 6 through to grades 13, from three elementary schools and two high schools, which represented the entire range of socioeconomic status in Thunder Bay. Individual classes were selected if respective teachers agreed to participate in the present study. In high school, most students were from general and advanced level classes, however students from one basic level class were also included in the present study.

Each student present on the day of testing was requested to participate in two phases of a longitudinal study. A total of 548 students (both nonsmokers and smokers) participated in Phase 1 of this study, while 334 students participated in both Phase 1 and 2 of this study. This indicates a 39% loss. However, non attendance was primarily due to illness, leaving school, or moving to another school. However, students who did not participate in Phase 2 tended to be older $t(546) = 4.40$, $p < .000$ with a mean age of 15.18, and also to smoke more often $t(546) = 2.46$, $p < .01$ with a mean of 2.72, than those who did participate in Phase 2, with respective means of 14.29 and 2.10. After controlling for age using Analysis of Covariance (ANCOVA), no difference in rate of smoking was found between participants who filled out the second questionnaire and those who did not $F(1, 545) = .89$, $p = .35$.

Participants were predominantly Caucasian (87.3%). Of the total

sample, 284 were male (51.8%) and 264 were female (48.2%). The mean age at Phase 1 was 14.64, and 14.29 at Phase 2. This difference in age being the result of non-participants at Phase 2 being older than students who participated in both Phase 1 and Phase 2. Six respondents did not fill out their age, however missing data was replaced by the mean age of participants in the same grade. One student was 20 years of age at Phase 1 only, and was included as a 19-year-old in the present study. Frequency, percent, and cumulative percent of age groups in Phase 1 and Phase 2, can be seen in Table 1.

Smoking Characteristics

At Phase 1 and Phase 2, 333 (61%) and 218 (64%) respondents respectively, smoked cigarettes or had smoked cigarettes some time in the past. More specifically, 144 (26%) participants at Phase 1, and 96 (21.5%) participants at Phase 2 had initiated smoking, while 188 (29%) participants at Phase 1, and 102 (30%) participants at Phase 2 classified themselves as experimental and maintenance smokers. The differences in smoking status between Phase 1 and Phase 2 participants, were also due to the fact that non-participants at Phase 2 were older than participants of both Phase 1 and Phase 2.

Procedure

There were two testing Phases seven months apart, the first from May to

June of 1997, and the second from December, 1997 to January, 1998. During the first session participants received verbal and written information regarding the nature of the present study; that the study was concerned with adolescent behaviors and smoking, and that each student was required to fill out a questionnaire and to provide a saliva sample for the researcher. Participants were assured that their responses would remain confidential, and that their participation was completely voluntary. Written consent was received from each participant, and from parents for each participant under the age of 18 years.

Perez-Stable, Mann, Marin, and Benowitz (1992) reported that adolescent self-reports of smoking are not always valid, and that smokers will sometimes classify themselves as non-smokers. Thus, a bogus pipeline procedure was used prior to the administration of questionnaires at Phase 1 (Botvin et al., 1994), in order to enhance the validity of self reported smoking status. Participants were informed that smoking leaves nicotine in the body for a long period of time, and that a chemical analysis of their saliva would detect the number of cigarettes they smoke. Each student was given an envelope containing a strip of paper, and was asked to provide the researcher with a saliva sample.

Self-administered questionnaires were then administered to entire classes, with approximately 10-20 students in each classroom. The name of

each participant and their identification code was written on a separate piece of paper, so that participants could be identified in the future, and questionnaires from Phase 1 and Phase 2 could be matched. The purpose of this procedure was explained to participants, and each student was assured that their individual responses would not be identified. Completion of the questionnaire took approximately 30 minutes and was carried out during classroom time. Participants were asked not to discuss their responses with other students until the data collection was complete, and were informed that a copy of the results would be made available to them upon completion of both phases of the study. Questionnaires and saliva sample kits were distributed and collected by the researcher.

Seven months later an attempt was made to track down each student who participated in the present study at Phase 1. At each school, groups of 10-20 students who had participated in the study, were asked to meet with the researcher in an assigned classroom at a specified time, to complete another questionnaire and provide a second saliva sample. An identical administration procedure to Phase 1 was followed, and participants received same questionnaires during both sessions.

Measures

The questionnaire consisted of items measuring self-reported smoking behavior, the social environment, and five sets of biopsychosocial factors. Most of the items included within this questionnaire have been used in past research (Conrad et al., 1992). A copy of the questionnaire can be found in Appendix A.

The means for most missing data were estimated by smoking group, except for items related directly to smoking behavior. Relevant items were reversed scored, and reliability analyses were performed to collapse items into composite scales. Internal consistencies were found to be generally high, ranging from .72 to .90. The means, standard deviations, and internal consistency values for continuous measures are reported in Table 2.

Smoking. A bogus pipeline procedure, as outlined earlier, was used to enhance the validity of self-reported smoking. A 13 point modified version of the smoking index developed by Botvin and colleagues (1992) was used to measure smoking status among participants at Phase 1 and Phase 2. This item divided participants into abstainers (never smokers), initiators (tried them and used to smoke occasionally), ex-smokers (used them regularly in the past), experimental smokers (monthly, weekly, a few times a day, once a day), and

maintenance smokers (half a pack, a pack or more a day). Due to restrictions in sample size, maintenance smokers and participants who had quit smoking at Phase 2, were not included in any analyses regarding the stages of the smoking acquisition process. Length of smoking and plans to quit smoking in the future were assessed among participants who smoked at least once a month.

Social Environment. Age and gender were recorded. A single item measured race/ethnicity for descriptive purposes only, and included: Caucasian, African, Native Canadian, and Others.

Social Bonding. Parental strictness (strictness, discipline, obey parents) and attachment to mother/father (care for parents, parents care, talking to mother, talking to father, and having fun with family) were used to record family bonding. Each item was measured on a five-point scale, ranging from (1) strongly agree to (5) strongly disagree. Discipline had a 90-10 split and parental strictness had a low item-total correlation with the others, and therefore neither were included in further analyses. Six of the eight items were found to be homogenous and unidimensional, and were summed to form one scale (α = .77).

Peer bonding was recorded by evaluating number of friends (many

friends, male friends, female friends), attachment to friends (care for friends, friends care, talk to friends, meet with friends, spend time with friends), and the presence or absence of a boyfriend or girlfriend. The first two groups of items were measured on a five-point scale ranging from (1) strongly agree to (5) strongly disagree. Number of male and female friends had low item-total correlations with the others, and thus were discarded. Having a boyfriend or girlfriend was theoretically different from the other items, however it was retained for further analyses. The remaining six items formed one scale (α = .76).

School bonding was measured by recording commitment and satisfaction with school (committed, satisfied, enjoy school, and do homework), academic expectations, academic achievement, and truancy behavior. The first three were measured on a five-point scale. Commitment and satisfaction items were measured on a scale ranging from (1) strongly agree to (5) strongly disagree, academic expectations from (1) grade school or less to (5) graduate or professional school, academic achievement from (1) doing badly to (5) doing very well. Truancy behavior was indicated by the number of days a student skipped or cut classes. Academic expectations and truancy behavior were theoretically different from the others, however were retained for further analyses. Doing homework had low item-total correlations with the other items

and was not used. The remaining four items were subsequently combined to form a scale ($\alpha = .78$).

Social Learning. Items pertaining to smoking among mother, father, stepmother, stepfather, brother, sister, older brother, and older sister were used to report family smoking. Stepfather, stepmother, brother, sister, older sister and older brother smoking each had 90-10 splits and could therefore not be used. A composite variable, sibling smoke, was created from brother and sister smoke, and was used for further analysis. Mother, father, and sibling smoking had low item-total correlations, and thus are theoretically different from one another. Each was retained for further analyses.

Peer smoking was measured by the reporting of friends smoking, friend's approval of smoking, and influencing others to smoke. Friends smoking was measured by a composite variable consisting of two standardized items, the number of friends who smoke and the presence or absence of best friend smoking ($\alpha = .84$). Friends' approval of smoking was measured with three items: whether students strongly agreed (1) or strongly disagreed (5) that their friends were against smoking, were in favor of smoking, and that their best friend would disapprove of their smoking. Disapproval of best friend had a low item-total correlation with the other items, and was not used. The remaining two

items were summed to form one scale (α=.82). Influencing others to smoke was also measured on a 5-point scale, and asked if students strongly agreed (1) or strongly disagreed (5) that they have or do try to influence their friends to smoke.

Adult approval of smoking and exposure to marketing were reported in order to measure other adult influences to smoke. Adult approval was measured with 1 item on a 5 point scale, ranging from (1) strongly agree to (5) strongly disagree, that the adult they admired the most would mind if they saw them smoking. However, adult approval had a 90-10 frequency split, and could not be used. Exposure to marketing was recorded using 2 items: the number of cigarette brands a participant could name, and the presence or absence of a favorite cigarette advertisement. These two items were combined to form an index of susceptibility to marketing.

Prevalence estimates of smoking in the population were measured with eight questions on a 5 point scale ranging from (1) almost none to (5) almost all, including the prevalence of smoking among people in general, among adults, teachers, males, females, students, peers, and fellow classmates. Prevalence estimates among teachers and adults had low item-total correlations with the others. The remaining six items were summed to form one scale (α = .71).

The availability of cigarettes was measured by recording offers for cigarettes and general availability of cigarettes. Offers for cigarettes was measured on a five point scale, asking if students are (1) never or (5) always offered cigarettes in general, from parents, brothers, sisters, and friends. Parental and sibling offers had 90-10 frequency splits, and thus were not included in further analyses. The remaining two items were subsequently combined (α=.90). General availability was measured on a 5-point scale, and assessed if students strongly agreed (1) or strongly disagreed (5), that it is easy to get a pack of cigarettes.

Pharmacological Factors. Addiction and number of cigarettes smoked were recorded to measure physiological motivation to smoke, among participants who smoked at least once a month and once a day, respectively. Addiction was measured using three items, asking if participants (1) strongly agreed or (5) strongly disagreed that smoking was a habit, that they had cravings for cigarettes, and that it was difficult not to smoke in places where it was prohibited (α = .78).

Personality/Intrapsychic Determinants. Self-esteem, risk-taking, and self-efficacy to refuse offers for cigarettes were recorded in order to measure

personality and intrapsychic factors. Self-esteem was reported using a 7-item scale developed by Harrison and Luxenberg (1995). The questions measured whether students strongly agreed (1) or strongly disagreed (5) that they feel good about themselves, are satisfied with themselves, are able to do things as well as others their age, feel they have much to be proud of, think they are no good at times, feel they do not do anything right, and that their lives are not very useful. Feeling they did nothing right and being able to do thing as well as others their age, had low item-total correlations with the other items and were not used. The remaining five variables were summed to form a self-esteem scale with $\alpha = .84$.

Five items were selected from the literature to record risk-taking behaviors among adolescents. Three items were measured on a five-point scale, asking if students strongly agreed (1) or strongly disagreed (5) that they enjoyed fast driving, that life with no danger would be dull, and that they like to take chances more than others their age. The remaining two items asked if students, would never (1) or always (5) take a dare to do something dangerous, and do something that is not safe just for the excitement of it. Fast driving had low item-total correlation with the others. The remaining four items were summed to form one scale ($\alpha = .81$).

Self-efficacy to refuse offers for cigarettes was reported using six items,

using a similar scale to one used previously by DeVries and colleagues (1995). Items included if students, strongly agreed (1) or strongly disagreed (5), that it would be difficult or easy to refuse an offer for a cigarette, that it would be difficult to refuse a cigarette offered by a friend, that it would be difficult not to smoke when friends are smoking, that there are many reasons not to smoke, and that they could refuse a cigarette when being called a coward. Reasons for not smoking and efficacy to refuse when being called a coward, had low item-total correlations with the others, and were discarded. The results were subsequently summed ($\alpha = .84$).

Knowledge, Beliefs, Attitudes, and Behavior. Knowledge, beliefs, attitudes, and behaviors were measured by recording of personal health risk awareness, knowledge of health risks related to smoking, beliefs about smoking, attitudes toward smoking, future intentions to smoke, and substance use. Personal health risk awareness was measured using three items from Greening and Dollinger (1990). These items asked what the chances of someone like themselves dying of a stroke, emphysema, and cancer were, from (1) almost none to (5) almost all. These items were subsequently summed to form one scale ($\alpha = .84$). Each participant was also required to name six health risks associated with smoking.

Using items from Charlton and colleagues (1989) general tobacco beliefs were measured by reporting health consequences (living a long life, living a healthy life, heart disease, coughing, lung cancer, loss of breath, bronchitis, keeping weight down), social consequences (belonging to a group, losing friends, older kids liking you more, having more friends, smoking to show off, to look tough, to look cool, to have more fun), and psychological/affective consequences (have more fun if you smoke, calms your nerves, helps to relax, makes you feel good, helps escape from problems, gives confidence) of smoking. Each of these items was measured on a five-point scale ranging from strongly agree (1) or strongly disagree (5). Six of the eight health beliefs had 90-10 frequency splits, thus only two (living a healthy life, living a long life) were summed to form a health beliefs scale ($\alpha = .73$). Four of the eight social beliefs (belonging to the group, older kids liking you more, having more friends, looking cool) and all six of the psychological affective beliefs were found to be homogenous and unidimensional, and were summed to form two separate scales, $\alpha = .73$ and $\alpha = .84$, respectively.

Attitudes toward smoking and intentions to smoke were measured with 5 items on a five point scale from strongly agree (1) to strongly disagree (5). Items measuring attitudes towards smoking included: being strongly against smoking, telling others you are against smoking, being bothered by smoking,

wishing people would stop smoking, and smoking being a waste of money. Smoking being a waste of money had low item-total correlations with the others, and thus the remaining 4 items were combined to form one scale (α = .78). Intentions to smoke in one year and when leaving school for good, were summed to form an intentions scale (α = .78).

Using part of the substance use scale within the Personal Experience Inventory; experience with 12 types of substances was assessed. These items were measured on a five point scale, and asked if students never (1) to always (5) used beer, wine, hard liquor, tranquilizers, quaaludes, inhalants, cocaine, PCP, heroin, marijuana, stimulants, and household products, to get high. Only three items (beer, liquor, and marijuana) were summed to create a substance abuse scale (α = .78), as the other nine groups of substances had 90-10 frequency splits, and were not often used in this population of adolescents.

Results

Bivariate correlations and inter-correlations were computed to examine the relationships among the variables. In order to summarize the present data set, factor analysis was used to collapse scales into higher order factors. Items with loadings below .45 were not included for interpretation of a factor, as loadings of .45 account for 20% of the overlapping variance. Two separate direct discriminant function analyses assessed whether variables measured at Phase 1 could predict group membership (never smoked, initiation, experimental smoking) at Phase 2, for both groups 10 to 14 and 15 to 19 years of age. Discriminant function analyses were also performed in order to assess if variables from Phase 1 could predict group membership at Phase 2, among participants who did or did not undergo a transition from 1) never smoke to initiation of smoking, 2) from initiation/experimentation to increased consumption, and 3) from maintenance smoking to decreased consumption. For the above analyses, correlations between predictors and discriminant functions, which were below .33, were not interpreted.

The correlations and inter-correlations among each of the predictors and smoking variables can be seen in Table 3. Age was significantly correlated with stage of smoking and length of smoking, however sex was not related to any of the smoking variables measured. One purpose of this study was to identify the many inter-relationships that existed within the present data set.

Factor analysis removes the redundancy within a set of correlated variables, allowing one to examine the smaller set of higher order factors that emerge. The correlation matrix contained several sizable correlations, many above .30, and thus was considered to be factorable (Tabachnick & Fidell, 1996).

Principal factors extraction with varimax rotation was performed on 24 items from Phase 1, with a total of 548 adolescents from ages 10 to 19. Biological groups of antecedents were excluded from this analysis as only participants who smoked filled out these sections. Having a boyfriend or girlfriend, personal risk awareness, and knowledge of health risks were also excluded, as only variables with at least one correlation above .33 were included within the present analysis.

Principal components extraction was used prior to principal factors to estimate the number of factors present and the absence of singularity and multicollinearity. Three factors were extracted, and both quartimax and equamax rotation were used to confirm the variable loadings on each factor. As indicated by squared multiple correlations (SMC's) all factors were internally consistent and well defined by the variables, each of the SMC's for factors from variables was .1. Communality values were moderate, indicating that variables were moderately well defined by this factor solution (Table 4).

With a cut off level of .45 for inclusion for interpretation of a factor, four of 24 variables did not load on any factors. Only two of the variables in the

solution were complex, attitude and intentions, both loading on factor 1 and factor 2. Standardized factor loadings, communalities, and percent of variance explained are shown in Table 4. Variables are grouped according to loadings on each factor, and by the size of loading to facilitate interpretation. Interpretive labels are suggested for each factor in a footnote. Correlations between each factor and variables not included in the factor solution can be seen in Table 5.

Stages of the Smoking Acquisition Process.

Past studies have suggested that a variety of factors are related to smoking among adolescents. However, few of these have examined the relationship between these variables and smoking, depending upon the developmental age of the adolescent. Consequently, a comprehensive examination of smoking predictors for adolescents ranging from ages 10 to 19, was undertaken in the present study. More specifically, participants from ages 10 to 14 and ages 15 to 19, were analyzed separately, and membership in the preparation, initiation, and experimental smoking groups were predicted, using discriminant function analysis. Biological variables were not included in this analysis as only a small percent of smokers (maintenance smokers) provided information pertaining to these variables.

Age Group 10 to 14 Years. Phase 1 data was used to predict smoking membership at Phase 2, among adolescents aged 15 to 19 years old. For participants aged 10 to 14, 27 predictors were entered, including; three variables related to family smoking, five social bonding variables, seven social learning variables, three personality/intrapsychic variables, and nine knowledge, belief, attitude, and behavior variables. Ten of the original 142 participants in the younger age group, who completed questionnaires at Phase 2, were excluded from this analysis because of missing data. For the remaining 132 participants (64 nonsmokers, 36 initiators, and 32 experimental smokers), evaluation of assumptions of multicollinearity and singularity revealed no threat to multivariate analysis. Although not normally distributed, transformation of variables revealed no differences in significance or percent of cases correctly classified. Thus, classification was based upon separate covariance matrices due to heterogeneity of variance/covariance matrices.

Two discriminant functions were calculated and obtained a combined χ^2 (54) = 166.75, $p<.001$. After removal of the first function, there was still an association between predictors and groups, $\chi^2(26) = 38.73$, $p<.05$. The two discriminant groups accounted for 84% and 16% of the between group variability, respectively. As shown in Figure 1, the first discriminant function maximally separated the experimental smokers from participants who have

never smoked, with participants who initiated smoking in the past falling between these two groups. Whereas, the second discriminant function discriminated participants who had initiated smoking in the past from the other two smoking groups. The loading matrix of correlations between predictors and discriminant functions can be seen in Table 6. Loadings less than .33 were not interpreted.

The best predictors for distinguishing between never smokers and experimental smokers (Function 1), in order of significance, can also be seen in Table 6. Non-smokers had fewer friends who smoked (mean = -.77), and had more negative attitudes toward smoking (mean = 1.61) than experimental smokers, with respective means of mean .46 and 3.03. Whereas, experimental smokers received more offers for cigarettes (mean = 2.81), had more friends that approved of smoking (mean = 3.24), and had greater intentions to smoke in the future (mean = 2.62) than never smokers, with respective means of 1.28, 1.59, and 1.28. Experimental smokers also appeared to be more aware of cigarette marketing (mean = 2.64), used drugs more often (mean = 2.27), were more willing to take risks (mean = 3.08), were more likely to have a sibling who smoked (mean = .47), and had more positive psychological beliefs towards smoking (mean = 2.27) than nonsmokers, with means of .78, 1.14, 1.95, .05, and 1.34, respectively.

Results indicated that attitudes, self-esteem, and knowledge of health

risks were the best predictors for discriminating participants who had initiated smoking, from never and experimental smokers in function 2 (Table 6). However, pairwise comparisons indicated that attitudes and self-esteem did not significantly discriminate never smokers from initiators, while knowledge of health risks did not discriminate initiators from experimental smokers. Usually, only the first one or two discriminant functions reliably separate groups in discriminant function analyses, and the remaining provide no further information and are better ignored (Tabachnick and Fidell, 1992). Thus, function 2 will not be interpreted, as it does not appear to provide reliable information regarding group membership.

For the sample of 141 adolescents aged 10 to 14, 106 (80%) were correctly classified, compared to 49 (37%) who would be correctly classified by chance alone (Table 7). The two discriminant functions correctly classified 57 (89%) nonsmokers, 22 (61%) participants who had initiated smoking in the past, and 27 (84%) experimental smokers. Cross-validation was done to check the stability of the classification procedure. Approximately seventy-five percent of the cases were used for calculation of the classification functions, and the resulting classification scheme was used to categorize the remaining twenty-five percent of the participants. For the 75% of the cases from which the functions were derived, there was a 86% correct classification rate. For the cross validation cases, classification decreased to 52%, still significantly better

than what would be expected from chance alone (34%).

Post-hoc testing of differences in mean values between the pairs of smoking groups were performed using the students t-test, with Bonferroni adjustment for type 1 error. An overall $\alpha < .05$ was kept for adjusted means. As can be seen in Table 8, never and experimental smokers aged 10 to 14 were significantly discriminated by variables which discriminated never and experimental smokers best in Function 1. In fact, post-hoc analyses suggested that the only variables which did not significantly discriminate between never smokers and experimental smokers were friend bonding, educational expectations, health beliefs related to smoking, personal health risk awareness, and knowledge of health risks. Thus, according to post-hoc analyses, never smokers also reported bonding more with their parents and with school, were less likely to have a girlfriend or boyfriend, were less likely to have a sibling and parents who smoked, influenced others to smoke less often, and estimated that the prevalence of smoking was less than did experimental smokers. Never smokers also differed from experimental smokers, in that they had higher self-esteem, were more efficacious in refusing offers for cigarettes, engaged in truancy behaviors less often, had more negative social beliefs towards smoking, and felt that cigarettes were not as easily available as experimental smokers.

Correspondingly, many of the same variables, which reliably separated

never smokers from experimental smokers, also separated participants who initiated smoking from experimental smokers in the exact same direction. The only variables, which did not separate these groups, were having a girlfriend or boyfriend, father and mother smoking, social beliefs, and the availability of cigarettes. Accordingly, variables, which did not separate never from experimental smokers, also did not discriminate initial from experimental smokers. However, participants who had initiated smoking in the past were more likely to have a girlfriend or boyfriend, a father, sibling, and friends who smoked, friends who approved of smoking, be offered cigarettes, be exposed to cigarette advertising, and have more positive social beliefs towards smoking in comparison to never smokers.

Age Group 15 to 19 Years. Original data from Phase 1 was also used to predict smoking membership at Phase 2, among the 15 to 19 year old age group. The same twenty-seven variables entered in the previous analysis, were also included in the present one. Only one of the original 147 adolescents in the older age group, who completed a questionnaire at Phase 2, was dropped from this analysis because of missing data. Evaluation of assumptions of multicollinearity and singularity revealed no threat to multivariate analysis for the remaining 146 participants (46 nonsmokers, 60 initial, and 40 experimental smokers). However, due to heterogeneity of variance/covariance matrices

classification was also based on separate covariance matrices within this analysis.

Two discriminant functions were computed and a combined $\chi^2(54) = 167.84$, $p<.001$ was obtained. There was no association between predictors and groups after removal of the first function, $\chi^2(26) = 23.81$, $p<.45$. The first discriminant function accounted for 91% of the between group variability, and maximally separated the experimental smokers from participants who had never smoked, with participants who initiated smoking in the past falling between these two groups (Figure 1).

The loading matrix of correlations between predictors and discriminant functions, for 15 to 19 year olds, can be seen in Table 6. Many of the same predictors which discriminated between never and experimental smokers among 10 to 14 year olds, also did so for the older age group. Like the age group 10 to 14 years, participants from the ages 15 to 19 who had never smoked, also had less intentions to smoke in the future (mean = 1.17), had more negative attitudes towards smoking (mean = 1.74), and reported using drugs less (mean = 1.37) than experimental smokers, with respective means of 2.84, 3.22, and 3.20. Correspondingly, participants who did not smoke were also offered cigarettes less often (mean = 1.84), and had more negative psychological beliefs related to smoking (mean = 1.50) than experimental smokers, with means of 3.56 and

3.22, respectively. However, for ages 15 to 19, friends' approval of smoking, exposure to marketing, and risk-taking did not clearly differentiate between never and experimental smokers. Whereas, contrary to the younger age group, non-smokers from the older age group were found to be significantly more efficacious in refusing cigarettes (mean = 1.30), and also were less likely to influence others to smoke (mean = 1.04) than participants who experimented with smoking, with respective means of 2.92 and 1.83.

Of the 146 adolescents aged 15 to 19, 108 (74%) were correctly classified, in comparison to 51 (35%) who would be correctly classified by chance alone. More specifically, the one discriminant function classified 34 (74%) nonsmokers, 43 (72%) participants who initiated smoking in the past, and 31 (78%) experimental smokers correctly (Table 7). Cross validation revealed that there was a 81% correct classification rate for the three-fourths of the cases the functions were derived from, and a 66% classification rate for the cross validation cases. This rate was better than what would be expected from chance alone (38%).

Multiple pairwise comparisons were also performed to determine which predictors reliably separated each group from each of the other two smoking groups, for adolescents aged 15 to 19 (Table 9). In general, each of the smoking groups examined among 15 to 19 year olds, were significantly discriminated in the same direction, by many of the same variables which

discriminated smoking groups among 10 to 14 year olds (Table 10). However, parent bonding, prevalence estimates of smoking, risk-taking, truancy, and social beliefs did not discriminate non-smokers and initial smokers from experimental smokers, in this age group. Also, initial and experimental smokers aged 15 to 19, were not significantly separated by school bonding, exposure to marketing, and self-esteem. Correspondingly, having a boyfriend or girlfriend, having a father and friends who smoked, having friends who approved of smoking, and being knowledgeable of health risks related to smoking did not discriminate clearly between non-smokers and initiators aged 15 to 19. On the other hand, contrary to adolescents aged 10 to 14, non-smokers and initiators from the ages of 15 to 19 were less aware of personal health risks of smoking than experimental smokers. Moreover, non-smokers aged 15 to 19 were found to have more negative health beliefs related to smoking, and used drugs less often and felt cigarettes were less available, than experimental and initial smokers, respectively. This was not the case for adolescents aged 10 to 14.

Supplementary Analyses on the Stages of the Smoking Acquisition Process.

Factor scores for each of the three factors were computed for each participant, using regression. Computed factor scores and variables from Phase 1, which were not included in the factor solution, were entered into two separate

discriminant function analyses to predict membership in smoking groups at Phase 2, among adolescents aged 10 to 14 and 15 to 19. A total of nine items were entered, including the three factors, three variables related to family smoking, two knowledge variables, and one bonding variable (Table 5).

In general, the previous analyses were supported by the summarized data, and only results related to the three factors will be commented on, as the significance of other variables has been previously noted. Classification rates were generally good, with 73.05% of 141 participants aged 10 to 14, and 65.38% of 181 participants aged 15 to 19, being classified correctly. Both classification rates were significantly above chance. Cross validation indicated a high degree of consistency within both classification schemes, and an unusual random division of cases into the cross validation sample.

For participants aged 10 to 14, the two discriminant functions obtained a combined χ^2 (18) = 138.43, p<.001. There was an association between the predictors and groups after removal of the first function, $\chi^2(8) = 21.72$, p<.01, with the two discriminant functions accounting for 89% and 11% of the between group variability, respectively. For participants aged 15 to 19, the two discriminant functions obtained a combined χ^2 (18) = 138.07, p<.001. However, there was no association between the groups and predictors after removal of the first function, $\chi^2(8) = 2.86$, p=.94. In this case, the first

discriminant group accounted for 99% of the between group variability.

The loading matrix for summarized data can be seen in Table 11. For both age groups, deviance and social influences, as well as beliefs and attitudes, were the best predictors for distinguishing between non-smokers and experimental smokers. For adolescents aged 10 to 14, experimental smokers were more deviant and had more negative social influences (mean = .26) than participants who had never smoked (mean = -.11), and had more negative attitudes and beliefs related to smoking (mean =.27) in comparison to never smokers (mean =-.23). Similar to the younger age group, never smokers aged 15 to 19 were less deviant and had less deviant social influences (mean = -.32) in comparison to experimental smokers (mean = .83), and also had less negative attitudes and beliefs related to smoking (mean =-.66) than experimental smokers (mean =.57).

Furthermore, participants aged 10 to 14 who had initiated smoking in the past bonded more often (mean = .53) than never smokers (mean =.21) and experimental smokers (mean = -.03). Also, post-hoc comparisons suggested that adolescents aged 10 to 14 had more negative beliefs and attitudes toward smoking than did experimental smokers, and that unlike ages 10 to 14, initial smokers from the ages of 15 to 19, were not found to bond with others more often than experimental smokers.

Transitional Phases of The Smoking Acquisition Process.

Few studies have examined a comprehensive group of predictors for each smoking transition in one study, and even fewer have examined decreasing consumption among maintenance smokers. Consequently, three direct discriminant function analyses were performed to examine the ability of the present data set to predict membership of participants in three smoking transition groups, 1) from non-smoking to initiation of smoking, 2) from initiation and experimental smoking to increased consumption, and 3) from maintenance smoking to decreased consumption. Initiation and experimental transitions to increased consumption could not be analyzed separately due to sample size constraints. Accordingly, separate analysis by age was also not possible, as this would significantly increase the case to variable ratio, making results of significance tests misleading due to heterogeneity of variance/covariance matrices (Tabachnick & Fidell, 1992). Consequently, only age and data which were significantly correlated with each transition, were included in each discriminant function analysis.

Nonsmoking to Initiation of Smoking. Six items from Phase 1 were entered into a discriminant function analysis to predict the transition from nonsmoking to the initiation of smoking, at Phase 2. These items included: age, family smoking, exposure to advertising, friends smoking, friends approval of

smoking, and having a boyfriend or girlfriend. Father, mother, and sibling smoking were combined to form a continuous family smoking variable, as each was positively correlated with the transition from never to initiation of smoking. Of the original 150 participants who were non-smokers at Phase 1 and completed questionnaires at Phase 2, 124 remained non-smokers and 26 began to smoke. However, due to large differences in sample size, 50% of participants who remained non-smokers were randomly selected for discriminant function analysis, and the other 50% were excluded. To validate this procedure, a separate analysis was also performed with the remaining 50% of these cases, excluding the 50% included initially. Similar findings emerged. Thus, 62 participants who remained non-smokers and 26 participants who began to experiment, were entered into a discriminant function analysis. Three were dropped from analysis because of missing data. For the remaining 85 participants (60 non-smokers and 25 initiators) evaluation of assumptions of multicollinearity or singularity revealed no threat to multivariate analysis.

One discriminant function was computed and obtained an $\chi^2(6) = 18.27$, $p<.01$. This discriminant function maximally separated participants who remained non-smokers from participants who initiated smoking. The loading matrix of correlations between predictors and the discriminant function can be seen in Table 11. Each of the predictors, excluding age, significantly

discriminated participants who remained nonsmokers from those who had initiated smoking. More specifically, participants who remained non-smokers were less likely to have family members who smoked (mean = .60) and were more likely to have a girlfriend or boyfriend (mean = 1.83), than were participants who initiated smoking, with means of 1.28 and .38, respectively. Non-smokers were also less likely to have friends who approved of smoking (mean = 1.86), were less likely to have friends who smoked (mean = -.54), and were less aware of cigarette marketing (mean = 1.24) than were initiators, with respective means of 2.42, -.17, and 1.88.

Of the 85 adolescents, 67 (78%) were correctly classified, in comparison to 50 (58%) who would be correctly classified by chance alone (Table 12). The discriminant function classified 56 (93%) participants who remained non-smokers and 11 (44%) participants who initiated smoking, correctly. The overall classification rate of 78%, was due to the disproportionate number of participants who initiated smoking being classified as participants who remained non-smokers (56%). It is possible that cases tended to be over classified into this group because of greater dispersion (Tabachnick & Fidell, 1996). A similar analysis was performed using separate covariance matrices, revealing that classification did not improve, but worsened. Also, transformation of variables did not significantly improve classification.

Cross validation was performed, and it was found that, for the three-

fourths of the cases from whom the functions were derived, there was a 78% correct classification rate. For cross validation cases, classification only decreased to 71%. However, the 25% of participants who initiated smoking were very poorly classified by the three-fourths of the sample (29%), which was most probably due to the extremely small sample used for the cross validation cases (n=7).

Initiation/Experimentation Transition. Twelve items from Phase 1 were entered into a discriminant function analysis to predict an increase in smoking among participants who had initiated smoking in the past or who were experimenting with cigarettes, at Phase 2. These items included age, mothers smoking, self-esteem, and 6 belief and attitude variables. Of the original 125 initiators and experimental smokers at Phase 1, 79 maintained their level of smoking and 46 increased or decreased their smoking status at Phase 2. Approximately 50% of initial and experimental smokers who maintained their smoking status at Phase 1, were randomly selected for discriminant function analyses due to differences in sample size. Separate analyses were also conducted with the remaining 50% of participants who maintained their smoking status, with very similar results.

Thus, a total of 85 experimental and regular smokers at Phase 1, who completed questionnaires at Phase 2, were included in this analysis. One was

dropped from analysis because of missing data. Thirty-eight participants maintained their cigarette consumption, while 34 increased and 12 decreased the amount of cigarettes they consumed. A separate analysis excluding the 12 participants who decreased their cigarette consumption was performed. Almost identical results were found, indicating that the present analysis is examining predictors related to increasing consumption within these two smoking groups. Evaluation of assumptions of multicollinearity and singularity, as well as equality of variance/covariance matrices revealed no threat to multivariate analysis.

For this discriminant function, which attempts to maximally separate initiators and experimental smokers who maintained their cigarette consumption level from those who increased their cigarette consumption level, a $\chi^2(12) = 35.11$, $p<.001$ was obtained. Excluding age, each of the predictors significantly distinguished between those who maintained and those who increased, their cigarette consumption level (Table 11). Participants who maintained their smoking status reported more negative attitudes toward smoking (mean = 1.97), had weaker intentions to smoke in the future (mean = 1.34), and had less positive psychological beliefs (mean = 1.71) than did ones who increased their cigarette consumption, with respective means of 2.96, 2.20, and 2.28. Also, maintainers had less friends who smoked (mean = -.33) than those who

increased their cigarette consumption (mean = .22), and were also less likely to have friends who approved of smoking (mean = 2.41) than ones who began to smoke more (mean = 2.97). Whereas, students who increased their cigarette consumption reported lower levels of self-esteem (mean = 3.57), less efficacy to refuse offers for cigarettes (mean = 2.35), and had a higher probability of influencing others to smoke (mean = 1.70), in comparison to those who maintained their smoking status, with respective means of 4.08, 1.74, and 1.24.

Of the 84 adolescents, 67 (80%) were correctly classified, in comparison to 42 (50%) who would be classified correctly by chance alone. As can be seen in Table 12, the discriminant function classified 31 (82%) participants who maintained their smoking status, and 36 (78%) who increased their smoking status, correctly. Cross validation revealed that 84% of participants were classified correctly from the 75% of the sample from which the functions were derived, while 81% were correctly classified for the remaining 25% of participants within the cross validation sample. This indicated a high degree of consistency in the classification system.

Maintenance Transition. Four items from Phase I which were correlated with the maintenance transition at Phase 2, were included within this analysis. Thus, age number of cigarettes smoked, influencing others to smoke, and prevalence estimates of smoking were entered into a discriminant function

analysis to predict decreasing consumption of cigarettes among maintenance smokers at Phase 2.

As in the previous analysis, approximately 50% of the original 125 smokers who maintained their smoking status from Phase 1 to Phase 2, were randomly selected for analyses. In total, 37 maintenance smokers who completed questionnaires at Phase 2, were included in this analysis. Of the 37 maintenance smokers, 24 maintained their level of cigarette consumption while 10 decreased, and 3 increased the number of cigarettes they smoked. Almost identical results were found after performing analyses with and without the 3 participants who increased their cigarette consumption, indicating that the present analysis is primarily focused on decreasing consumption among participants who smoke daily. Evaluation of assumptions of multicollinearity or singularity, and equality of variance/covariance matrices revealed no threat to multivariate analysis.

A computed $\chi^2(3) = 18.12$, $p<.001$ was obtained for this discriminant function, which maximally separated maintenance smokers who maintained their consumption level at Phase 1 from those who decreased their consumption of cigarettes at Phase 2. As can be seen in Table 11, the best distinguishing predictors for those who maintained their cigarette consumption and those who did not, include: influencing others to smoke, prevalence estimates of smoking,

and the number of cigarettes the participant smoked. Students who maintained their daily smoking status were more likely to influence others to smoke (mean = 2.46), estimated that more people smoked (mean = 4.04), and smoked more cigarettes (mean = 3.54) than participants who decreased their smoking, with respective means of 1.63, 3.69, and 2.54.

Of the 37 maintenance smokers, 28 (86%) were correctly classified, in comparison to 21 (57%) who would be classified correctly by chance alone (Table 12). The discriminant function classified 22 (91.7%) participants who maintained their smoking status, and 10 (76.9%) participants who decreased their cigarette consumption, correctly. Cross validation indicated that 89% of the cases from whom the functions were derived were classified correctly, while 66% were classified correctly for the cross validation sample. This is significantly better than would be expected by chance alone (55%).

Discussion

Evidence suggests that adolescent smoking is a complex developmental process, which involves multiple stages and transitional behaviors (Flay et al., 1983). However, most past research within this area has focused on the antecedents of smoking onset in general, and not the developmental process of becoming a smoker. Correspondingly, an extensive number of variables have been related to adolescent smoking onset, but many of these predictors have not been examined within the same study. In fact, biological antecedents of smoking have been virtually neglected in the past. Moreover, the differential importance of smoking predictors and developmental age has primarily been assessed among groups of adolescents and young adults, and not among different age groups of adolescents. Therefore, the purpose of the present study was three-fold, and included, 1) assessing which of the smoking predictors included within the present study measured similar or different constructs, 2) assessing which predictors best discriminated between the stages of smoking onset for adolescent age groups 10 to 14 years and 15 to 19 years, and 3) evaluating the importance of each predictor for the transitions involved in the development of smoking behavior, as well as the hypothesis that external and internal influences will be related to the early and later transitions of smoking behavior, respectively.

Predictors of Adolescent Smoking Onset

Four groups of predictors related to the onset of smoking were summarized in the present study, including social bonding, social learning, personality/intrapsychic, and knowledge, belief, attitude, and behavioral variables (Flay, 1992). Three higher order factors emerged defining three underlying constructs, including, 1) deviance and social influences, 2) beliefs, attitudes, and behaviors, and 3) social bonding. For factor 1, findings primarily suggested that actual and perceived environmental smoking, wider social influence, and deviance were assessing similar underlying constructs. Whereas, both psychological and social beliefs towards smoking, general attitudes toward smoking, and behaviors related to future smoking were measuring one underlying construct in factor 2. Factor 3 consisted of perceived social environment and personality variables.

Not surprisingly, these findings indicate that variables of direct and indirect social influence, proposed by Banduras' (1963) social learning theory, are in fact measuring similar social learning constructs in factor 1. However, results also indicated that more deviant behavior, such as truancy, drug-use, and risk-taking, also loaded on factor 1. This suggests that deviance was more highly inter-related with actual and perceived social influences to smoke, than to attitudes, beliefs, behaviors, or social bonding.

This may be explained by the fact that a bi-directional relationship exists

between deviant behaviors and social influences to smoke. For example, friends' smoking has been found to predict the onset of smoking among adolescents, and at the same time smoking onset has been found to predict further acquisition of friends who smoke (Chassin et al., 1984). Thus, it is also possible that adolescents may partly engage in deviant behaviors due to peer social influences, but may also be more likely to choose friends who are more deviant in nature. In other words, this factor may represent peer deviance and peer influence towards deviance, as well as actual and perceived self-deviance.

This hypothesis is also supported by the fact that variables within factor 1 appear to be measuring peer related smoking influences specifically. Father, mother, and sibling smoking did not load on factor 1 as expected, and in fact, variables related to family or adult smoking either had low item-total correlations with the other social influence variables, or were responded to similarly across all participants. This indicates that family smoking and adult influences to smoke were independent of the peer social influence and deviance construct measured within the present study.

Results for factor 2 partially support Ajzen and Fisbeins' (1980) classification of attitudes and subjective norms as significant predictors of intentions to smoke, as well as DeVries, Dijkstra, and Kuklman's (1988) finding that self-efficacy is also an important aspect of this earlier model. Not surprisingly, results from the present study also suggest that an individuals

decision to influence others to smoke, is also related to their attitudes, beliefs, self-efficacy regarding offers for cigarettes, and intentions to smoke in the future. Unexpectedly, health belief variables, and general as well as personal knowledge of smoking health risks, were not associated with smoking beliefs, attitudes, and behaviors within the present study. This suggests that variables related to health are independent of other belief and attitude variables, and while it is not clear why this is the case, it may be partially related to the tremendous amount of publicity regarding the health consequences of smoking (Viscusi, 1991). In general, adolescents are well informed regarding the health risks of smoking (Greening and Dollinger, 1991; Leventhal et al., 1992), and even in the present study, knowledge and health beliefs related to smoking were responded to quite consistently in a positive direction. Consequently, due to this exposure, health related variables may be qualitatively different than more psychosocial belief and attitude variables.

Jessor and Jessor (1977) suggested an individual's personality and their perceived environment (perceived support) influences an individual's adoption of problem behaviors such as smoking. Factor 3 is consistent with the grouping of personality and perceived environmental variables within problem behavior theory (Jessor & Jessor, 1977). However, the fact that risk-taking loaded on Factor 1 while self-efficacy loaded on Factor 2, suggests that the personality variables examined within the present study were not assessing similar

underlying constructs. More clearly, risk-taking and self-efficacy did not appear to be examining personality traits, but more behavioral aspects of deviance and attitudes, respectively.

Predictors of the Stages of Smoking Onset for Two Different Age Groups

The second purpose of the present study was to assess which predictors best discriminated between the stages of smoking onset, depending on membership within two different age groups of adolescents. It was expected that the groups of predictors examined would differentially separate adolescents within the preparation, initiation, and experimental stages of the smoking acquisition process; based on membership in the age group 10 to 14 years or the age group 15 to 19 years. To our knowledge, this issue has not been examined in great detail in the past, particularly among a large adolescent population.

In general, classification rates in smoking stages among both age groups were good, with 82% of participants being correctly classified correctly for ages 10 to 14 years, and 76% being correctly classified for ages 15 to 19 years. Validity of the functions was not exceptional for either age group, however each was significantly better than would be expected by chance. Discriminant function 2 did not discriminate initial from never and experimental smokers very reliably for either age group, and thus only post-hoc analyses were interpreted for these comparisons. Supplementary analyses on the stages of the

onset process, using summarized data, generally supported the above analyses.

There was substantial similarity between significant predictors and smoking group, for both groups of adolescents aged 10 to 14 and 15 to 19 years. For example, in both age groups, never smokers reported having fewer social influences to smoke than did participants who had initiated smoking in the past. Moreover, never smokers and initial smokers were less likely to be deviant, were exposed to less deviant social influences, and had more negative beliefs and attitudes than experimental smokers. Despite these apparent similarities however, differences between predictors depending on age, were found for each stage of the smoking onset process.

More clearly, social bonding variables and family models of smoking discriminated between most of the stages of the smoking onset process for adolescents aged 10 to 14 years, however did not do so for adolescents aged 15 to 19 years. Risk-taking and truancy discriminated never and initial smokers from experimental smokers aged 10 to 14 years, while drug use discriminated non-smokers and initial smokers aged 15 to 19 years. Moreover, social belief and social normative variables discriminated between each of the stages examined among the younger age group, whereas the older group of adolescents were discriminated by health related beliefs and knowledge of the health risks associated with smoking.

In general, these findings are supported by past research. Chassin,

Presson, Sherman, and colleagues (1984) found that personality and perceived environmental variables were more predictive for the transition from experimental to regular smoking, among middle-school students than for high-school students. Beliefs related to academic success and independence have been found to predict adolescent and not young adult smoking onset (Chassin et al., 1991). Whereas, rebelliousness and risk taking is not a powerful motive for adult onset of smoking, but has been related to adolescent smoking onset in the past (Chassin et al., 1990). Correspondingly, Chassin and colleagues (1991) found that beliefs regarding the negative social consequences of smoking were related to adolescent onset of smoking, whereas beliefs regarding the health consequences of smoking were more predictive for young adult onset of smoking. They concluded that adolescents are not strongly affected by health concerns, but that health beliefs may play an important role in smoking decisions at later ages. Findings in the present study suggest that this may also be the case for groups of younger (ages 10 to 14 years) and older (ages 15 to 19 years) adolescents.

Jessor and Jessor (1977) proposed that certain personality and perceived environment variables (such as low perceived support), may motivate certain subgroups of adolescents to adopt prematurely adult-like activities in violation of age graded norms. Since adolescence is a period of increasing peer influences, familial variables may become less important for some adolescents

as they become older (Chassin et al., 1984). Thus, parental bonding, self-esteem, and parental and sibling smoking factors may no longer motivate older groups of adolescents, in this case adolescents aged 15 to 19 years, to adopt smoking behavior. Correspondingly, school bonding, risk-taking, and truancy may not discriminate between the later stages of smoking onset among adolescents aged 15 to 19 years, because of this group's need to adopt even more deviant behaviors such as drug use, in order to violate newly acquired age-graded norms.

Also, as stated earlier, the importance of peer relations increases dramatically during adolescence. Thus, for adolescents aged 10 to 14, peer related social beliefs and wider social norms may be an important determinant of problem behaviors such as cigarette use, because of an adolescent's heightened sense of self consciousness and identity confusion at this time (Gordon, 1986). For example, Stein et al. (1996) found that good social relations, extroversion, and cheerfulness were less related to smoking onset as the students within his study became older. Likewise, for adolescents in the present study aged 15 to 19 years, social beliefs and social norms related to smoking may not be as important, as they may be more likely to adhere to more mainstream social values than adolescents aged 10 to 14 years. This may also explain the fact that friends' smoking and friends' approval of smoking did not discriminate never and initial smokers aged 15 to 19 years, but did so for

adolescents aged 10 to 14 years.

While adolescents do have a good sense of the health risks related to smoking (Gordon, 1986; Greening & Dollinger, 1991; Viscusi, 1991), they also tend to minimize the personal risks associated with smoking (Greening & Dollinger, 1991; Gordon, 1986; Viscusi, 1991). Other researchers have found that teenagers will minimize the risk of experimental and occasional health risk activities in comparison to adults (Cohn, Macfarlane, Yanez, and Imai, 1995), whereas adolescents will acknowledge the health risks related to smoking more readily than younger children (Greening & Dollinger, 1991). The present findings also tended to support this trend. While both non-smokers and smokers within our sample were quite knowledgeable about the health risks related to smoking, adolescents aged 15 to 19 years were more likely to internalize their knowledge regarding the risks associated with smoking than adolescents aged 10 to 14 years.

Transitional Stages of Adolescent Smoking

A third purpose of the present study was to examine the relationship between different groups of antecedents and the different transitions involved in adolescent smoking. It was expected that different groups of predictors would separate participants in the three transitions examined: never smoking to initiation, increasing consumption among initial and experimental smokers, and

decreased consumption among maintenance smokers. Results tended to support this general hypothesis, as well as the hypothesis that more external determinants would be involved in the earlier smoking transitions, while both external and internal determinants would be important for later transitions.

Past research has also found that similar external social determinants of smoking influence the transition from non-smoking to the initiation of smoking. For example, Chassin et al. (1984) found that family influences to smoke were more predictive of earlier smoking, but not for the uptake of more regular smoking. However, in the present study peer relations were important for both the early and later transitions to smoking behavior. Whereas, Chassin et al. (1984) found that peer relations were important for the later transitions to smoking behavior only. Together, these results highlight the consistent importance of peer relations in the present sample, and suggests that familial variables become less important in our sample as adolescents become older or progress through the smoking onset process.

In the present study, marketing awareness was also very important in predicting the initiation of smoking behavior. Receptivity to tobacco advertising (Evans, Farkas, Gilpin, Berry, & Pierce, 1995) and cigarette brand awareness (Charlton & Blair, 1989) have been related to an increased susceptibility to smoking onset among adolescents in the past. However, to our knowledge, no study has examined the relationship between marketing and the

different transitions within the smoking onset process. The fact that awareness of marketing predicted the transition to initial but not increased cigarette consumption, suggests that marketing may be exerting an initiatory influence on the thoughts and actions of adolescents, in relation to smoking, as part of a socialization process. Chassin, Presson, and Sherman et al. (1984) found that academic and independence expectations, parental and friend's agreement, locus of control, and tolerance for deviance predicted the transition from never smoking to initial smoking. This was not the case in the present study, where in general, social bonding and personality variables did not discriminate never smokers from initiators. However, these findings may not have been replicated in the present study due to the small number of participants within this analysis, and subsequent lack of statistical power. On the other hand, our previous findings indicated that social bonding variables discriminated between the stages of smoking onset best, for younger adolescents aged 10 to 14. Thus, it is also possible that social bonding and personality variables discriminate never smokers from initiators within our sample, specifically among our younger group of adolescents. Nonetheless, this hypothesis could not be examined, as further analyses were restricted by the size of the present sample.

Findings also suggested that attitude and psychological belief variables predicted the transition from initial and experimental smoking to increasing consumption, however did not do so for the transition from never to initial

smoking. This is partially supported by Chassin, Presson, and Sherman et al. (1984), who found that intentions, smoking attitudes, and normative beliefs predicted the transition to regular smoking better than the transition to initial smoking. These findings may be explained by the fact that attitudes towards smoking are more accessible and stable when they are based upon direct smoking experience, as attitude-behavior consistency is increased.

A sub-sample of the participants within the present study were daily smokers who decreased their consumption of cigarettes from Phase 1 to Phase 2. This decrease in consumption probably reflects the fact that older adolescents were included within this study, as the mean age of maintenance smokers was 15.52, whereas the general age of the sample was 14.63. Consequently, this decrease in consumption suggests that there is a point during adolescence when individuals begin to stop smoking (Chassin et al., 1990). The fact that lower prevalence estimates of peer smoking predicted a decrease in the level of cigarettes consumed by daily smokers, suggests that this sub-sample of adolescents may be likely to adhere to more mainstream social norms, and not adolescent smoking norms. Correspondingly, they may be less likely to influence others to smoke for this same reason, as participants who are decreasing their own level of cigarette consumption, would be less likely to influence others to smoke. At the same time, nicotine dependence is also an important aspect of cessation in this sub-sample of adolescents, as those who

maintained their cigarette consumption level smoked more than ones who decreased their consumption level.

Implications

A central goal underlying the present study was to better understand how to improve smoking prevention programs for adolescents. This is a very important issue, since adolescent smoking has been increasing steadily over the last thirty years and is often associated with lifetime cigarettes use. Past attempts at smoking prevention or cessation have been overly simplistic (Chassin et al., 1990), and have placed a heavy emphasis on one of two things, 1) the health consequences of smoking and devaluing the image of a young smoker (Chassin et al., 1990; Greening & Dollinger, 1991), and/or 2) combating the many social influences to smoke; be it peer, parent, or societal (Chassin et al., 1990; Cleary et al., 1988; Elder et al., 1993).

However, in light of the present findings, it is apparent that future smoking prevention and cessation programs for adolescents must be much more comprehensive (Elder, Sallis, Woodruff, & Wildey, 1993), and must be based upon an understanding of the dynamic and interactive nature of the smoking acquisition process. First and foremost, the entire process of becoming a smoker should be taken into account when developing adolescent smoking programs, as smoking behavior does not involve a series of discrete changes.

More specifically, the different antecedents related to the stages of smoking should be considered for each individual, and the numerous fluctuations within the smoking onset process should be considered to be potential opportunities for intervention. Attention must be given to the predictors of both the onset of smoking, as well as experimental and maintenance smoking behavior (Stein et al., 1996). For example, prevention programs could focus on social influences of smoking such as family and peer smoking, whereas intervention programs for experimental and regular smokers could address an individuals' beliefs and attitudes towards smoking, as well as their social normative beliefs and level of physiological dependence.

Secondly, it is essential that future adolescent smoking programs take into account the developmental age of the adolescent, as adolescents who are older may begin or continue to smoke for different reasons than younger adolescents. More specifically, programs which are focused on attitudes and beliefs, and identification of the health consequences of smoking may be more beneficial for older adolescents. Whereas, a program designed to address peer and family attachments and influences to smoke, and larger social norm and belief variables related to smoking, may be more influential with a younger group of adolescents.

Limitations and Future Research

The present study had a number of limitations. For example, only six months separated testing between Phase 1 and Phase 2. Consequently, this may not be a long enough period to adequately assess transitions from one stage of smoking to the next. Especially when considering the fact that adolescents may go through several cycles of experimental and regular smoking before they begin to smoke daily or quit smoking altogether. Correspondingly, only a small number of participants actually changed their smoking status from Phase 1 to Phase 2, due to the six-month time lapse between testing. Thus, it is likely that sample size restrictions reduced the power of our analyses, and limited the number of statistical analyses which could be performed. For example, initial and experimental transitions to increasing cigarette consumption had to be examined concurrently within this study. This is particularly concerning when one considers the fact that, different variables may predict the transition from initial to experimental smoking and experimental to maintenance smoking. Furthermore, it was also not possible, given the small number of participants in each transitional group, to do analyses separately by age group. Thus, findings regarding the differential importance of smoking predictors depending on age, refer only to the stages of the smoking onset process.

Due to the limited scope and purpose of the present study, the inter-relationships among predictors were not examined. Thus, this study was not

based on a specific theoretical model, and may be considered more a-theoretical and exploratory in nature. Only participants who smoked daily responded to each of the pharmacological items within this study, and thus only very limited analyses could be performed for this group of smoking predictors. Two-hundred and fourteen students (39%) in Phase 1 did not participate in Phase 2 of the present study. Although there were few differences between participants and non-participants at Phase 2, non-participants were older than participants. Since older adolescents would be more likely to belong to a higher smoking status group, it is possible that the higher attrition rates of older adolescents may have lead to differential prediction for the last two transitions examined: 1) increasing consumption among initial and experimental smokers, and 2) decreasing consumption among maintenance smokers. Finally, these results apply to elementary and secondary school students, and may not easily be generalized to a population of adolescents who are not attending school.

This study suggests a number of potential areas for future research. First of all, a comprehensive set of smoking variables, including pharmacological variables, should be examined among a larger number of participants in future research. Accordingly, assessment of scale properties and factor analysis should also be conducted, in order to validate the findings reported in this study. Secondly, the differential importance of predictors for each smoking transition should be examined among different age groups of adolescents, and a series of

longitudinal studies would enable a researcher to examine both the antecedents and consequences of different smoking transitions. Finally, path analysis would allow one to examine the interrelationships between different groups of smoking predictors, and how these inter-relationships consequently influence adolescent smoking behavior.

In conclusion, results revealed that most of the smoking predictors examined within this study were measuring three similar constructs: deviance and social influence, beliefs, attitudes, and behaviors, and social bonding. Family smoking, social bonding, beliefs, and social norms discriminated between smoking groups differentially, depending on age. Not surprisingly, more external social influences predicted earlier smoking transitions, while peer influence and beliefs and attitudes predicted later transitions. Normative social influence and pharmacological variables best predicted decreasing cigarette consumption.

References

Ajzen, R.P. (1982). Three models of attitude-behavior consistency. In M.P. Zanna, E.T. Higgins, & C.P. Herman (Eds.), Consistency in Social Behavior: The Ontario Symposium (Vol. 2. pp. 131-146). Hillsdale, NJ: Lawrence Erlbaum.

Bandura, A. (1963). Social Learning and Personality Development. New York: Holt, Rhinehart & Winston.

Bartecchi, C.E., Mackenzie, T.D., & Schrier, R.W. (1995). The global tobacco epidemic. Scientific American, 45-51.

Bauman, K.E., & Ennett, S.T. (1996). On the importance of peer influence for adolescent drug use: commonly neglected considerations. Addiction, 91, 185-198.

Benson, P.L., & Donahue, M.J. (1989). Ten-year trends in at-risk behaviors: A national study of black adolescents. Journal of Adolescent Research, 4, 125-139.

Berg-Kelly, K. (1995). Normative developmental behavior with implications for health and health promotion among adolescents: A Swedish cross-sectional survey. Acta paediatr, 84, 278-288.

Biglan, A., Duncan, T.E., Ary, DV., & Smolkowski. (1995). Peer and parental influences on adolescent tobacco use. Journal of Behavioral Medicine, 18, 315-330.

Botvin, G.J., Epstein, J.A.; Schinke, S.P.; & Diaz, T. (1994). Predictors of cigarette smoking among African-Americans: Low teenage consumption and high adult use. Journal of Developmental and Behavioral Pediatrics, 15, 67-73.

Bowen, D.J., Dahl, K., Mann, S.L., & Peterson, A.V. (1991). Descriptions of early triers. Addictive Behaviors, 16, 95-101.

Breslou, N., & Peterson, E.L. (1996). Smoking cessation in young adults: Age at initiation of cigarette smoking and other suspected influences. American Journal of Public Health, 86, 214-219.

Brunswick, A.F. & Messri, P. (1984). Casual factors in onset of adolescents' cigarette smoking: a prospective study of urban black youth. Advances in Alcohol and Substance Abuse, 3, pp. 35-52.

Charlton, A., & Blair, V. (1989). Predicting the onset of smoking in boys and girls. Social Science and Medicine, 29, 813-818.

Chassin, L., & Presson, C.C. (1990). The natural history of cigarette smoking: Predicting young-adult smoking outcomes from adolescent smoking patterns. Health Psychology, 9, 701-716.

Chassin, L., Presson, C.C., Sherman, S.J. (1990). Social psychological contributions to the understanding and prevention of adolescent cigarette smoking. Personality and Social Psychology Bulletin, 16, 133-151.

Chassin, L., Presson, C.C., Sherman, S.J. (1984). Cigarette smoking and adolescent psychosocial development. Basic and Applied Social

Psychology, 5, 295-315.

Chassin, L., Presson, C.C., Sherman, S.J., & Edwards, D.A. (1991). Four pathways to young-adult smoking status: Adolescent social-psychological antecedents in a midwestern community sample. Health Psychology, 10, 409-418.

Chassin, L., Presson, C.C., Sherman, S.J., & Mulvenon, S (1994). Family history of smoking and young adult smoking behavior. Psychology of Addictive Behaviors, 8, 102-110.

Chassin, L., Presson, C.C., Sherman, S.J., Corty, E. & Olshavsky, R.W. (1984). Predicting the onset of cigarette smoking in adolescents: A longitudinal study. Journal of Applied Social Psychology, 14, 224-243.

Cleary, P.D., Hitchcock, J.L., Semmer, N., Flinchbaugh, L.J, & Pinney, J.M. (1988). Adolescent smoking: Research and health policy. The Milbank Quarterly, 66, 1343-1347.

Cohn, L.D., Macfarlane, S., Yanez, C., & Imai, W.K. (1995). Risk-perception: Differences between adolescents and adults. Health Psychology, 14, 217-222.

Conrad, K.M., Flay, B.R., & Hill, D. (1992). Why children start smoking cigarettes: Predictors of onset. British Journal of Addiction, 87, 1711-1724.

De Vries, H., Backbier, E., Kok, G., & Dijkstra, M. (1995). The impact

of social influence in the context of attitude, self-efficacy, intention, and Previous behavior as predictors of smoking onset. Journal of Applied Social Psychology, 25, 237-257.

De Vries, H., Dijkstra, M., & Kuhlman, P. (1998). Self-efficacy: the third factor besides attitude and subjective norm as a predictor of behavioral intentions. Health Education Research, 3, 273-282.

Del Rio, M.C., & Alvarez, F.J. (1994). Patterns of smoking in Spain. Results from a regional general population survey. European Journal of Epidemiology, 10, 595-598.

Elder, J.P., Sallis, J.K., Woodruff, S.I., Wildey, M.B. (1993). Tobacco-refusal skills and tobacco use among high-risk adolescents. Journal of Behavioral Medicine, 16, 629-640.

Evans, N., Farkas, A., Gilpin, E., Berry, C., & Pierce, J.P. (1995). Influence of tobacco marketing and exposure to smokers on adolescent susceptibility to smoking. Journal of The National Cancer Institute, 87, 1539-1545.

Feigelman, W., & Lee, J. (1995). Probing the paradoxical pattern of cigarette smoking among African-Americans. Low Teenage Consumption and High Adult Use. Journal Drug Education, 25, 307-320.

Flay, B.R. (1992). Youth tobacco use: risk, patterns, and control, in Slade, J. &Orleans, C.T. (Eds) Nicotine Addiction: Principles and Management

(London, Oxford university Press).

Flay, B.R., D'Avernas, J.R., Best, J.A., Kersell, M.W., & Ryan, K.B. (1983). Cigarette smoking: Why young people do it and ways of preventing it, in: McGrath, P.J. & Firestone, P. (Eds) Pediatric and Adolescent Behavioral Medicine, 132-183 (New York, Springer).

Foxcroft, D.R., & Lowe,G. (1995). Adolescent drinking, smoking and other substance use involvement: links with perceived family life. Journal of Adolescence, 18, 159-177.

Foulds, J., & Ghodse, A.H. (1995). The role of nicotine in tobacco smoking: Implications for tobacco control policy. Journal Roy Soc Health, 225-230.

Foulds, J., Godfrey, C. (1995). Counting the costs of children's smoking. BMJ, 311, 1152-1154.

Friedman, L.S., Lichtenstein, E., & Biglan, A. (1985). Smoking onset among teens: An empirical analysis of initial situations. Addictive Behaviors, 10, 1-13.

Gerber, R.W., & Newman, I.M. (1989). Predicting future smoking of adolescent experimental smokers. Journal of Youth and Adolescence, 18, 191-200.

Goddard, E. (1992). Why children start smoking. British Journal of Addiction, 87, 17-25.

Gordon, N.P (1986). Never smokers, triers and current smokers: three distinct target groups for school-based antismoking programs. Health Education Quarterly, 13, 163-180.

Greening. L., & Dollinger, S.J. (1990). Adolescent smoking and perceived vulnerability to smoking related causes of death. Journal of Pediatric Psychology, 16, 687-699.

Harrison, P.A., & Luxenberg, M.G. (1995). Comparisons of alcohol and other drug problems among Minnesota adolescents in 1989 and 1992. Arch Pediatr Adolecs Med, 149, 137-143.

Hirschman, R.S., Leventhal, H., & Glynn, K. (1984). The development of smoking behavior: Conceptualization and supportive cross-sectional survey data. Journal of Applied Social Psychology, 14, 184-206.

Jessor , R., & Jessor, S.L. (1977) Problem behavior and psychosocial development: A longitudinal study of youth. New York: Academic press.

Kafka, R.R., & London, P. (1991). Communication in relationships and adolescent substance use: The influence of parents and friends. Adolescence, 26, 586-598.

Klesges, R.C., & Robinson, L.A. (1995). Predictors of smoking onset in adolescent African American boys and girls. Journal Of Health Education, 26, 85-88.

Krohn, M.D., Skinner, W.F., Massey, J.L., & Akers, R.L. (1985). Social

learning theory and adolescent cigarette smoking: A longitudinal study. Social Problems, 32, 455-471.

Leventhal, H. & Cleary, P. D. (1980). The smoking problem: A review of the research and theory in behavioral risk modification, Psychological Bulletin, 88, pp. 370-405.

McCubbin, H.I., Needle, R.H., & Wilson, M. (1985). Adolescent health risk behaviors: Family stress and adolescent coping as critical factors. Family Relations, 34, 51-62.

McNeill, A.D., Jarvis, M.J., Stapelton, J.A., Russell, M.A.H., Elser, J.R., Gammage, P., & Gray, E.M. (1988). Prospective study of factors predicting uptake of smoking in adolescents. Journal of Epidemiology and Community Health, 43, 72-78.

Michell, L., & West, P. (1995). Peer pressure to smoke: The meaning depends on the method. Health Education Research, 39-49.

Nutbeam, D., & Aaro, L.E. (1991). Smoking and pupil attitudes towards school: the implications for health education with young people. Health Education Research, 6, 415-421.

Perez-stable, E.J., Mann, G., Marin, B.V., & Benowitz, N.L. (1992). Am Rev Respir Dis, 145, 53-57.

Prokhorov, A.V., Pallonen, U.E., Fava, J., Ding, L., & Niaura, R. (1996). Measuring nicotine dependence among high-risk adolescent smokers.

Addictive Behaviors, 21, 117-127.

Santi, S., Best, J.A., Brown, K.S., & Cargo, M. (1991). Social environment and smoking initiation. The International Journal of the Addictions, 25 (7A+8A), 881-903.

Stanton, W.R. (1995). DSM-111-R Tobacco dependence and quitting during late adolescence. Addictive Behaviors, 20, 595-603.

Stein, J.A., Newcomb, M.D., & Bentler, P.M. (1996). Initiation and maintenance of tobacco smoking: Changing personality correlates in adolescence and young adulthood. Journal of Applied Social Psychology, 26, 160-187.

Tabachnick, B. G., & Fidell, L. S. (1996). Using multivariate statistics (3rd ed.). Harper Collins College Publishers: NewYork.

U.S. Surgeon General (1989). Reducing the health consequences of smoking: 25 years of progress. A report of the Surgeon General. (DHHS Publication no. COC 89-8411). Washington, DC: U.S. Gov't Printing Office.

Van Roosmalen, E.H., & McDaniel, S.A. (1992). Adolescent smoking intentions: Gender differences in peer context. Adolescence, 27, 87-105.

Vicary, J.R., Lerner, J.V. (1983). Longitudinal perspectives on drug use: Analyses from the New York longitudinal study. Journal Drug Education, 13, 275-285.

Viscusi, W.K. (1991). Age variations in risk perceptions and smoking

decisions. The Review of Economics and Statistics, 577-588.

Table 1

Frequency and Percent of Age Groups in the Present Study During Phase 1 and Phase 2

Age	Phase 1 (n = 548)			Phase 2 (n = 334)		
	Frequency	%	Cumulative %	Frequency	%	Cumulative %
10	19	3.5%	3.5%	10	3.0%	3.0%
11	49	9.0%	12.4%	33	9.9%	12.9%
12	60	10.9%	23.5%	46	13.8%	26.6%
13	49	8.8%	32.3%	26	7.8%	34.4%
14	57	10.4%	42.7%	36	10.8%	45.2%
15	104	19.0%	61.7%	80	24.0%	69.2%
16	76	14.0%	75.5%	52	15.6%	84.7%
17	72	13.0%	88.5%	38	11.4 %	96.1%
18	44	8.0%	96.5%	10	3.0%	99.1%
19	19	3.5%	100.0%	3	.9%	100.0%

Table 2

Means, Standard Deviations, and Internal Consistency

Scale	M	SD	α
Age	14.64	2.36	--
Smoking category	1.96	.81	--
Age first smoke	11.78	2.52	--
Plan to quit	1.61	.49	--
Number years smoked	3.06	1.34	--
Attitudes	2.35	1.10	.78
Intention to smoke	1.86	1.11	.78
Social beliefs	1.74	.83	.74
Health beliefs	1.78	.90	.73
Psychological beliefs	1.91	.91	.84
Influence others to smoke	1.46	.89	--
Personal risk awareness	2.54	1.00	.84
Knowledge of health risks	2.60	1.31	--
Prevalence estimates	3.66	.61	.72
Friends approval	2.64	1.21	.82
Friends smoking*	--	--	.84
1. Best friend smoking	.36	.48	--
2. Friends smoking	1.73	1.84	--
Offers for cigarettes	2.43	1.22	.90
Marketing exposure	2.08	1.38	--

Table 2

Means, Standard Deviations, and Internal Consistency

Scale	M	SD	α
Availability	3.53	1.53	--
Drug use	2.08	1.15	.86
Mother smoking	1.37	.48	--
Father smoking	1.39	.49	--
Sibling smoking	1.30	.46	--
Self-efficacy to refuse offers	2.10	1.18	.84
Risk-taking	2.84	.98	.81
Self-esteem	3.98	.92	.84
Parent bonding	4.03	.77	.77
Friend bonding	4.53	.63	.76
School bonding	3.55	.85	.78
Bofriend/Girlfriend	1.68	.47	--
Educational Expectations	2.67	.84	--
Truancy	2.02	2.90	--
Addiction	3.37	1.18	.82
Number cigarettes smoked	3.22	1.35	--

Note. * Standardized z scores for these scales. Original values for variables given.

rson Correlation Coefficients Between the Original Variables Measured

iable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ex																			
ge	-.01 (548)																		
moking	.10 (334)	.27*** (334)																	
ransition 1[a]	.13 (88)	-.04 (88)	.90*** (88)																
ransition 2	.10 (85)	-.17 (85)	.69*** (85)	-- --															
ransition 3	-.12 (37)	.26 (37)	-.66*** (37)	-- --	-- --														
Plan to quit	.14 (145)	.09 (145)	-.02 (80)	-- --	-.02 (17)	.00 (36)													
NYS	.01 (141)	.19* (141)	.01 (77)	-- --	.24 (17)	-.02 (37)	-.26** (138)												
Attitude	.00 (548)	.21*** (548)	.57*** (344)	-.05 (88)	.53*** (85)	-.16 (37)	-.37** (145)	.23** (141)											
IS	.14*** (544)	.13** (544)	.57*** (332)	.15 (87)	.44*** (85)	-.01 (37)	-.28** (144)	.36*** (140)	.64*** (544)										
SB	-.09* (548)	-.10* (548)	.25*** (344)	-.12 (88)	.22* (85)	-..10 (37)	-.15 (145)	-.10 (141)	.18*** (548)	.27*** (544)									
HB	-.06 (548)	.24*** (548)	.24*** (344)	-.12 (88)	-.07 (85)	-.23 (37)	-.20* (145)	.12 (141)	.36*** (548)	.37*** (544)	.26*** (548)								
PsyB	.04 (548)	.16*** (548)	.48*** (344)	.14 (88)	.34** (85)	-.02 (37)	-.12 (145)	.00 (141)	.55*** (548)	.64*** (544)	.38*** (548)	.37*** (548)							

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
14.Influence	-.01 (548)	.07 (548)	.37*** (334)	.06 (88)	.26* (85)	.36* (37)	-.21** (145)	.06 (141)	.31*** (548)	.41*** (544)	.39*** (548)	.36*** (548)	.43*** (548)						
15. PRA	.12** (548)	.04 (548)	.22*** (334)	.20 (88)	.10 (85)	-.20 (37)	.25** (145)	.15 (141)	.13** (548)	.16*** (544)	.06 (548)	.10* (548)	.09* (548)	.11** (548)					
16. KHR	.23*** (548)	.24*** (548)	.11 (334)	.01 (88)	-.13 (85)	-.00 (37)	-.02 (145)	.08 (141)	.07 (548)	.09* (544)	-.09* (548)	-.03 (548)	.05 (548)	-.07 (548)	.08 (548)				
17. PE	.12** (548)	.39*** (548)	.25*** (334)	.05 (88)	.00 (85)	-.34* (37)	.05 (145)	.17* (141)	.23*** (548)	.15*** (544)	.11** (548)	.11** (548)	.17*** (548)	.07 (548)	.26*** (548)	.06 (548)			
18. FA	.06 (548)	.34*** (548)	.52*** (334)	.26* (88)	.26* (85)	-.01 (37)	-.15 (145)	.27*** (141)	.56*** (548)	.50*** (544)	.13** (548)	.29*** (548)	.42*** (548)	.21*** (548)	.16*** (548)	.10** (548)	.41*** (548)		
19. FS	.15*** (548)	.31*** (548)	.62*** (334)	.24* (88)	.32** (85)	-.11 (37)	-.06 (145)	.27*** (141)	.57*** (548)	.59*** (544)	.11** (548)	.30*** (548)	.47*** (548)	.24*** (548)	.21*** (548)	.13** (548)	.41*** (548)	.75*** (548)	
20. Offers	.12** (548)	.36*** (548)	.61*** (334)	.01 (88)	.20 (85)	-.07 (37)	-.20* (145)	.14 (141)	.56*** (548)	.53*** (544)	.09* (548)	.27*** (548)	.45*** (548)	.25*** (548)	.17*** (548)	.14*** (548)	.40*** (548)	.62*** (548)	.67*** (548)
21. ME	-.04 (548)	.34*** (548)	.48*** (334)	.21* (88)	.08 (85)	.04 (37)	-.00 (145)	.02 (141)	.36*** (548)	.33*** (544)	.06 (548)	.18*** (548)	.27*** (548)	.12** (548)	.09* (548)	.20*** (548)	.27*** (548)	.40*** (548)	.43*** (548)
22.Availability	-.08 (546)	.45*** (546)	.32*** (333)	-.05 (88)	.05 (85)	.07 (37)	-.09 (145)	.02 (141)	.30*** (546)	.26*** (542)	.05 (546)	.23*** (546)	.28*** (546)	.14*** (546)	.01 (546)	.02 (546)	.31*** (546)	.41*** (546)	.38*** (546)
23.Drug use	.02 (548)	.48*** (548)	.58*** (334)	.16 (88)	.19 (85)	-.06 (37)	-.14 (145)	.20* (141)	.48*** (548)	.47*** (544)	-.00 (548)	.32*** (548)	.40*** (548)	.26*** (548)	.12** (548)	.14*** (548)	.30*** (548)	.54*** (548)	.61*** (548)
24.Mom smoke	.05 (548)	-.04 (548)	.15** (334)	.22* (88)	.23* (85)	.08 (37)	.04 (145)	.19* (141)	.11** (548)	.17*** (544)	.09* (548)	.12** (548)	.09* (548)	.07 (548)	.17*** (548)	-.01 (548)	.11** (548)	.14*** (548)	.19*** (548)
25.Dad smoke	.06 (546)	-.11** (546)	.15** (333)	.23* (88)	-.01 (85)	-.11 (37)	-.09 (144)	.08 (140)	.09* (546)	.13** (542)	.06 (546)	.09* (546)	.10* (546)	.06 (546)	.13** (546)	-.03 (546)	-.02 (546)	.12** (546)	.14** (546)
26. Sib smoke	.07 (543)	.12** (543)	.34*** (330)	.23* (86)	.17 (84)	-.27 (37)	.02 (145)	.07 (141)	.28*** (543)	.29*** (539)	.06 (543)	.20*** (543)	.28*** (543)	.10* (543)	.13** (543)	.06 (543)	.16*** (543)	.29*** (543)	.35*** (543)
27.Efficacy	.09* (548)	-.02 (548)	.42*** (334)	.01 (88)	.29** (85)	-.24 (37)	-.07 (145)	.18* (141)	.50*** (548)	.65*** (544)	.31*** (548)	.26*** (548)	.53*** (548)	.34*** (548)	.22*** (548)	.03 (548)	.11** (548)	.38*** (548)	.46*** (548)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
28. Risk taking	-.13** (548)	.26*** (548)	.36*** (334)	.04 (88)	.10 (85)	-.02 (37)	-.26** (145)	.02 (141)	.38*** (548)	.33*** (544)	.10* (548)	.23*** (548)	.34*** (548)	.23*** (548)	-.01 (548)	.01 (548)	.23*** (548)	.37*** (548)	.34*** (548)
29.Self-esteem	-.15*** (548)	-.01 (548)	-.22*** (334)	.01 (88)	-.28** (85)	.15 (37)	-.02 (145)	-.02 (141)	-.20*** (548)	-.20*** (544)	-.31*** (548)	-.16*** (548)	-.26*** (548)	-.19*** (548)	-.16*** (548)	.03 (548)	-.09* (548)	-.18*** (548)	-.17*** (548)
30. PB	-.05 (548)	-.16*** (548)	-.24*** (334)	.02 (88)	-.12 (85)	-.27 (37)	.13 (145)	-.05 (141)	-.31*** (548)	-.27*** (544)	-.17*** (548)	-.24*** (548)	-.30*** (548)	-.22*** (548)	-.06 (548)	.03 (548)	-.17*** (548)	-.26*** (548)	-.28*** (548)
31. FB	.21*** (548)	-.07 (548)	.02 (334)	.11 (88)	.05 (85)	-.07 (37)	.02 (145)	-.10 (141)	-.09* (548)	-.05 (544)	-.23*** (548)	-.22*** (548)	-.13** (548)	-.21*** (548)	-.03 (548)	.10* (548)	-.04 (548)	-.00 (548)	.00 (548)
32. GB	-.15*** (543)	-.07 (543)	-.29*** (330)	-.28** (87)	-.21* (84)	.19 (37)	.10 (144)	-.22** (140)	-.22*** (543)	-.24*** (539)	.02 (543)	-.03 (543)	-.13** (543)	-.03 (543)	-.10* (543)	-.10* (543)	-.11** (543)	-.27*** (543)	-.33*** (543)
33. SchB	.07 (546)	-.17*** (546)	-.28*** (334)	-.05 (88)	-.10 (85)	.04 (37)	.15 (145)	-.14 (141)	-.39*** (546)	-.31*** (542)	-.09* (546)	-.20*** (546)	-.31*** (546)	-.07 (546)	.05 (546)	.05 (546)	-.19*** (546)	-.31*** (546)	-.27*** (546)
34. EE	.08* (548)	-.15*** (548)	-.13* (334)	-.03 (88)	.08 (85)	.03 (37)	-.02 (145)	-.05 (141)	-.16*** (548)	-.14*** (544)	-.04 (548)	-.16*** (548)	-.08 (548)	-.05 (548)	.10* (548)	.10* (548)	-.09* (548)	-.12** (548)	-.13** (548)
35. Truancy	.03 (548)	.35*** (548)	.29*** (334)	.01 (88)	.15 (85)	.12 (37)	-.19* (145)	.18* (141)	.36*** (548)	.35*** (544)	.01 (548)	.23*** (548)	.31*** (548)	.11** (548)	.08 (548)	.08 (548)	.23*** (548)	.37*** (548)	.43*** (548)
36. Addiction	.13 (149)	-.11 (149)	.01 (81)	-- --	-.01 (17)	-.06 (37)	-.12 (145)	.36*** (141)	.26*** (149)	.56*** (148)	.05 (149)	.12 (149)	.26*** (149)	.27*** (149)	.09 (149)	.14 (149)	.16* (149)	.36*** (149)	.34*** (149)
37. # Cigarettes	.11 (116)	.10 (116)	.18 (58)	-- --	-- --	-.33* (37)	-.38*** (114)	.44*** (114)	.18* (116)	.41*** (115)	.01 (116)	.15 (116)	.10 (116)	.02 (116)	.14 (116)	.14 (116)	.07 (116)	.25** (116)	.28** (116)

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

Note = n is in brackets

*Transition 1= Non-smoking to Experimental

Transition 2 = Experimental/Regular increase

Transition 3: Maintenance decrease

NYS = Number Years Smoked

IS = Intention to smoke

SB = Social beliefs

HB = Health beliefs

PsyB = Psychological beliefs

PRA = Personal risk assessment

KHR = Knowledge health risks

PE = Prevalence Estimates

FA = Friends approval of smoking

FS = Friends smoking

ME = Marketing exposure

PB = Parent bonding

FB = Friend bonding

GB = Girlfriend/Boyfriend

SchB = School bonding

EE = Educational expectations

Variable	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
14. Influence																		
15. PRA																		
16. KHR																		
17. PE																		
18. FA																		
19. FS																		
20. Offers																		
21. ME	.49*** (548)																	
22.Availability	.50*** (546)	.43*** (546)																
23.Drug use	.60*** (548)	.44*** (548)	.44*** (546)															
24.Mom smoke	.13** (548)	.13** (548)	.00 (546)	.09* (548)														
25.Dad Smoke	.08 (546)	.09* (546)	-.00 (544)	.01 (546)	.34*** (546)													
26. Sib smoke	.29*** (543)	.18*** (543)	.18*** (541)	.26*** (543)	.16*** (543)	.13** (542)												
27.Efficacy	.39*** (548)	.21*** (548)	.17*** (546)	.33*** (548)	.11** (548)	.09* (546)	.22*** (543)											

Variable	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
28. Risk taking	.46*** (548)	.36*** (548)	.47*** (546)	.45*** (548)	.07 (548)	.03 (546)	.25*** (543)	.21*** (548)										
29. Self esteem	-.15*** (548)	-.06 (548)	-.03 (546)	-.13** (548)	-.12** (548)	-.10* (546)	-.09* (543)	-.33*** (548)	-.06 (548)									
30. PB	-.26*** (548)	-.15*** (548)	-.16*** (546)	-.32*** (548)	-.07 (548)	-.07 (546)	-.16*** (543)	-.24*** (548)	-.28*** (548)	.37*** (548)								
31. FB	.08* (548)	.04 (548)	.07 (546)	-.02 (548)	-.03 (548)	.05 (546)	-.03 (543)	-.08* (548)	.04 (548)	.26*** (548)	.30*** (548)							
32. GB	-.24*** (543)	-.13** (543)	-.14*** (541)	-.22*** (543)	-.10* (543)	-.07 (541)	-.20*** (538)	-.15*** (543)	-.08 (543)	.05 (543)	.05 (543)	-.13** (543)						
33. SchB	-.32*** (546)	-.23*** (546)	-.24*** (544)	-.29*** (546)	-.08 (546)	-.10* (544)	-.21*** (541)	-.25*** (546)	-.32*** (546)	.26*** (546)	.34*** (546)	.18*** (546)	.05 (541)					
34. EE	-.13** (548)	-.10* (548)	-.11** (546)	-.17*** (548)	-.03 (548)	-.09* (546)	-.16*** (543)	-.12** (548)	-.03 (548)	.14*** (548)	.18*** (548)	.15*** (548)	-.00 (543)	.32*** (546)				
35. Truancy	.42*** (548)	.29*** (548)	.27*** (546)	.48*** (548)	.07 (548)	.08 (546)	.28*** (543)	.23*** (548)	.29*** (548)	-.13** (548)	-.25*** (548)	-.04 (548)	-.12** (543)	-.30*** (546)	-.11** (548)			
36. Addiction	.27*** (149)	.11 (149)	.04 (149)	.16* (149)	.20** (149)	.24** (148)	.11 (149)	.57*** (149)	.14 (149)	-.03 (149)	-.28*** (149)	-.11 (149)	-.11 (148)	-.36*** (149)	-.03 (149)	.12 (149)		
37. # Cigarettes	.26** (116)	.06 (116)	.17 (116)	.26** (116)	.01 (116)	.11 (115)	.04 (116)	.21* (116)	.22* (116)	.07 (116)	-.11 (116)	-.10 (116)	-.16 (115)	-.13 (116)	-.04 (116)	.23** (116)	.36*** (116)	

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

Note = n is in brackets

*Transition 1= Non-smoking to Experimental

Transition 2 = Experimental/Regular increase

Transition 3: Maintenance decrease

PRA = Personal risk assessment

KHR = Knowledge health risks

PE = Prevalence Estimates

FA = Friends approval of smoking

FS = Friends smoking

ME = Marketing exposure

PB = Parent bonding

FB = Friend bonding

GB = Girlfriend/Boyfriend

SchB = School bonding

EE = Educational expectations

Table 4

Factor Loadings, Communalities (h2), Percents of Variance and Covariance For Principal Factors Extraction and Varimax Rotation.

Item	Factor 1[a]	Factor 2[b]	Factor 3[c]	h^2
Offers	.79	.00	.00	.70
Drug use	.74	.00	.00	.60
Friends smoking	.74	.00	.00	.69
Friends approve	.71	.00	.00	.61
Availability	.67	.00	.00	.45
Marketing exposure	.63	.00	.00	.41
Risk-taking	.60	.00	.00	.39
Attitude	.57	.49	.00	.59
Truancy	.56	.00	.00	.37
Prevalence estimates	.52	.00	.00	.28
Intention to smoke	.46	.70	.00	.70
Efficacy to refuse offers	.00	.69	.00	.56
Psychological beliefs	.00	.68	.00	.62
Social beliefs	.00	.62	.00	.48
Influence others to smoke	.00	.60	.00	.42
Friend bonding	.00	.00	.69	.52
Parent bonding	.00	.00	.64	.50
Self-esteem	.00	.00	.56	.42
School bonding	.00	.00	.55	.48

Table 4

Factor Loadings, Communalities (h2), Percents of Variance and Covariance For Principal Factors Extraction and Varimax Rotation.

Item	Factor 1[a]	Factor 2[b]	Factor 3[c]	h^2
Educational expectations	.00	.00	.51	.31
Health beliefs	.00	.00	.00	.32
Father smoking	.00	.00	.00	.08
Mother smoking	.00	.00	.00	.10
Sibling smoking	.00	.00	.00	.20
Percent of Variance	22.12	13.80	9.06	

[a]Factor 1 Deviance and Social Influences
[b]Factor 2 Beliefs and Attitudes
[c]Factor 3 Social Bonding
*As loadings under .45 are not interpreted, they have been replaced by zeros.

Table 5

Pearson Correlation Coefficients Between Factors and Variables

Variable	Factor 1 Deviance and Social Influence		Factor 2 Beliefs, Attitudes, Behavior		Factor 3 Social Bonding	
Smoking	.58 **	(327)	.44**	(327)	-.06	(327)
Transition 1[a]	.15	(85)	.13	(85)	.12	(85)
Transition 2[b]	.18	(84)	.39***	(84)	.03	(84)
Transition 3[c]	-.11	(37)	.08	(37)	.19	(37)
Age	.53**	(534)	-.15**	(534)	-.14**	(534)
Sex	.06	(534)	.08	(534)	.11*	(534)
Girlfriend/Boyfriend	-.27**	(529)	-.14**	(529)	-.09*	(529)
Mother smoking	.09*	(534)	.29**	(534)	.03	(534)
Father smoking	.03	(534)	.28**	(534)	.06	(534)
Sibling smoking	.39**	(534)	.18**	(534)	-.11**	(534)
Health risks	.17**	(546)	-.01	(548)	.06	(543)
PRA	.14**	(546)	.17**	(548)	.13**	(543)
Addiction	.24**	(147)	.35**	(147)	-.11	(147)
Number of cigarettes	.31**	(114)	.14	(114)	-.05	(114)
Plan to quit	-.15	(143)	-.22**	(143)	.05	(143)
Number Years Smoked	.23**	(139)	.11	(139)	-.04	(139)

Note: N is in brackets **p<.01 *p<.05
[a] Transition 1 = Non-smoking to Initiation
[b] Transition 2 = Initiation/experimentation transition
[c] Transition 3 = Maintenance decrease
PRA = Personal risk awareness

Table 6

Results of Discriminant Function Analyses for Age Groups 10 to 14 and 15 to 20.

Predictor Variables	Ages 10 to 14 Loading Matrix[a] 1	2	F (2, 138)	Ages 15 to 19 Loading Matrix 1	2	F(2, 179)
Friends smoking	.60	-.04	46.47***	.49	-.19	35.47***
Attitudes	.49	-.40	35.59***	.51	-.11	38.14***
Offers	.52	.02	35.28***	.48	.07	33.66***
Friends approval	.48	.12	30.05***	.29	.06	11.92***
Intention to smoke	.45	-.21	26.82***	.52	-.26	40.70***
Marketing exposure	.42	.22	24.68***	.26	.24	10.67***
Drug use	.37	-.08	17.93***	.49	.39	36.41***
Risk-taking	.34	-.01	14.63***	.09	.01	1.12
Sibling smoking	.33	.13	14.31***	.23	.08	7.87***
Influence others to smoke	.32	-.05	13.41***	.33	.03	16.25***
Psychological beliefs	.33	-.02	11.41***	.37	-.03	19.81***
Prevalence estimates	.29	.04	11.13***	-.00	-.04	.02
Parent bonding	-.27	.15	10.31***	-.06	-.02	.57
Self-esteem	-.24	.33	10.05***	-.14	-.06	3.07*
Efficacy to refuse offers	.22	-.24	7.75***	.47	-.18	32.77***
Mother smoking	.24	.04	7.66***	.04	.12	.49
Father smoking	.20	.32	7.65***	.02	.08	.14

Table 6

Results of Discriminant Function Analyses for Age Groups 10 to 14 and 15 to 20.

Predictor Variables	Ages 10 to 14 Loading Matrix* 1	2	F (2, 138)	Ages 15 to 19 Loading Matrix* 1	2	F (2, 179)
Girlfriend/Boyfriend	-.20	-.21	6.11**	-.19	.02	5.35**
School bonding	-.20	.07	5.44**	-.08	-.16	1.41
Availability	.17	.15	4.34*	.14	.33	4.34*
Truancy	.17	-.14	4.10*	.10	-.03	1.58
Social beliefs	.32	.10	3.32***	.12	.06	1.99
Knowledge health risks	.03	.34	3.09*	-.01	.07	.07
Health beliefs	.11	-.09	1.86	.18	.13	5.11**
Personal risk awareness	-.11	-.09	1.84	.20	-.02	5.87**
Educational expectations	-.07	.12	1.00	-.10	.07	1.55
Friend bonding	.03	.16	.78	.09	.03	1.16
Canonical R	.82	.53		.82	.41	
Eigenvalue	2.02	.40		2.03	.20	

[a]Pooled within group correlations of predictor variables with discriminant functions
***p<.001 ** p <.01 * p<.05

Table 7

Classification Matrices for Age Groups 10 to 14 and 15 to 20

Actual Group Membership		Predicted Group Membership: Never Smoked	Initiation	Experimentation
Ages 10 to 14[a]				
Never Smoked	64	57 (89%)	6 (9%)	1 (2%)
Initiation	36	11 (31%)	22 (61%)	3 (8%)
Experimentation	32	4 (13%)	1 (3%)	27 (84%)
		Percent of grouped cases correctly classified: 80%		
Ages 15 to 20[b]				
Never Smoked	46	34 (74%)	12 (26%)	0 (0 %)
Initiation	60	14 (23%)	43 (72%)	3 (5%)
Experimentation	40	1 (3%)	8 (20%)	31 (78%)
		Percent of grouped cases correctly classified: 74%		

[a] n = 132
[b] n = 146

Table 8

Pairwise Comparisons of all Variables entered in a Discriminant Function Analyses for Ages 10 to 14 using Bonferroni Adjustment.

Predictor Variables	Never and Initiation			Never and Experimentation			Initiation and Experimentation		
	Never Mean (SD)[a]	Initiation Mean (SD)	Mean Difference	Never Mean (SD)	Experimentation Mean (SD)	Mean Difference	Initiation Mean (SD)	Experimentation Mean (SD)	Mean Difference
Parent bonding	4.33 (.70)	4.31 (.66)	.02	4.33 (.70)	3.70 (.68)	.63***	4.31 (.66)	3.70 (.68)	.63***
School bonding	3.96 (.71)	3.87 (.92)	.09	3.96 (.71)	3.36 (.78)	.59**	3.87 (.92)	3.36 (.78)	.51*
Friend bonding	4.86 (.65)	4.72 (.51)	-.13	4.86 (.65)	4.61 (.61)	.25	4.72 (.51)	4.61 (.61)	.11
Girlfriend/Boyfriend	1.85 (.36)	1.62 (.49)	.24*	1.85 (.36)	1.58 (.50)	.28**	1.62 (.49)	1.58 (.50)	.04
SE	2.89 (.84)	2.92 (.77)	-.03	2.89 (.84)	2.67 (.99)	.22	2.92 (.77)	2.67 (.99)	.26
Father smoking	.26 (.44)	.61 (.50)	-.35***	.26 (.44)	.61 (.50)	-.35**	.61 (.50)	.61 (.50)	.00
Mother smoking	.26 (.44)	.41 (.50)	-.15	.26 (.44)	.61 (.50)	-.35**	.41 (.50)	.61 (.50)	-.20
Sibling smoking	.10 (.28)	.27 (.45)	-.20*	.10 (.28)	.47 (.51)	.40***	.27 (.45)	.47 (.51)	-.20
Friends smoking	-.77 (.25)	-.35 (.73)	-.42**	-.77 (.25)	.42 (.87)	-1.19***	-.35 (.73)	.42 (.87)	-.77***
Friends approval	1.59 (.77)	2.29 (1.01)	-.70***	1.59 (.77)	3.24 (1.20)	-1.65***	2.29 (1.01)	3.24 (1.20)	-.95***
IS	1.07 (.31)	1.28 (.76)	-.21	1.07 (.31)	1.88 (1.14)	-.81***	1.28 (.76)	1.88 (1.14)	-.60**
Prevalence estimates	3.26 (.72)	3.46 (.60)	-.20	3.26 (.72)	3.85 (.57)	-.59***	3.46 (.60)	3.55 (.57)	-.39*
Offers	1.34 (.70)	1.79 (.77)	-.45*	1.34 (.70)	2.71 (1.17)	-1.45***	1.79 (.77)	2.77 (1.17)	-1.45***
Marketing exposure	.83 (1.12)	1.70 (1.29)	-.87***	.83 (1.12)	2.57 (1.24)	-1.74***	1.70 (1.29)	2.57 (1.24)	-.87**

'able 8

'airwise Comparisons of all Variables entered in a Discriminant Function Analyses for Ages 10 to 14 using Bonferroni Adjustment

'redictor Variables	Never and Initiation			Never and Experimentation			Initiation and Experimentation		
	Never Mean (SD)[a]	Initiation Mean (SD)	Mean Difference	Never Mean (SD)	Experimentation Mean (SD)	Mean Difference	Initiation Mean (SD)	Experimentation Mean (SD)	Mean Difference
'elf-esteem	4.13 (.82)	4.26 (.97)	-.13	4.13 (.82)	3.39 (.97)	.73***	4.26 (.97)	3.39 (.97)	.86***
'isk-taking	2.00 (.80)	2.31 (.86)	-.31	2.00 (.80)	3.00 (1.03)	-1.00***	2.31 (.86)	3.00 (1.03)	-.69**
'fficacy	1.87 (.96)	1.92 (.93)	-.05	1.87 (.96)	2.70 (1.26)	.83***	1.92 (.93)	2.70 (1.26)	-.77**
)rug use	1.16 (.56)	1.36 (.67)	-.20	1.16 (.56)	2.06 (.97)	-.90***	1.36 (.67)	2.06 (.97)	-.70***
'ruancy	.40 (.81)	.38 (.75)	.02	.40 (.81)	1.03 (1.72)	-.63*	.38 (.75)	1.03 (1.72)	-.65*
\ttitudes	1.63 (.75)	1.69 (.86)	-.06	1.63 (.75)	3.03 (.98)	1.40***	1.69 (.86)	3.03 (.98)	-1.34***
ntention to smoke	1.26 (.59)	1.47 (.76)	-.21	1.26 (.59)	2.45 (.94)	-1.19***	1.47 (.76)	2.45 (.94)	-.98***
'ocial beliefs	1.47 (.65)	1.87 (.80)	-.40*	1.47 (.65)	2.30 (.92)	-.83***	1.87 (.80)	2.30 (.92)	-.43
Iealth beliefs	1.44 (.88)	1.56 (.91)	-.12	1.44 (.88)	1.79 (.89)	-.35	1.56 (.91)	1.79 (.89)	-.22
'sychological beliefs	1.36 (.64)	1.62 (.67)	-.26	1.36 (.64)	2.15 (1.00)	-.79***	1.62 (.67)	2.15 (1.00)	-.54**
'RA	2.41 (1.12)	2.41 (.97)	.00	2.41 (1.12)	2.79 (1.08)	-.37	2.41 (.97)	2.79 (1.08)	-.38
CHR	2.22 (1.15)	2.79 (1.42)	-.58	2.22 (1.15)	2.30 (1.45)	-.08	2.79 (1.42)	2.30 (1.45)	.49
\vailability	2.25 (1.57)	2.85 (1.60)	-.60	2.25 (1.57)	3.21 (1.67)	-.97*	2.85 (1.60)	3.21 (1.67)	-.37

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

:E = Educational expectations IS = Influence others to smoke

'RA = Personal risk awareness KHR = Knowledge health risks

Table 9

Pairwise Comparisons of all Variables entered in a Discriminant Function Analyses for Ages 15 to 20 using Bonferroni Adjustment.

Predictor Variables	Never and Initiation			Never and Experimentation			Initiation and Experimentation		
	Never Mean (SD)[a]	Initiation Mean (SD)	Mean Difference	Never Mean (SD)	Experimentation Mean (SD)	Mean Difference	Initiation Mean (SD)	Experimentation Mean (SD)	Mean Difference
Parent bonding	4.11 (.60)	4.07 (.63)	.04	4.11 (.60)	3.95 (.88)	.16	4.07 (.63)	3.95 (.88)	.12
School bonding	3.74 (.74)	3.56 (.83)	.18	3.74 (.74)	3.48 (.68)	.26	3.56 (.83)	3.48 (.68)	.08
Friend bonding	4.50 (.59)	4.56 (.53)	-.06	4.50 (.59)	4.68 (.47)	-.18	4.56 (.53)	4.68 (.47)	-.12
Girlfriend/Boyfriend	1.83 (.38)	1.75 (.44)	.08	1.83 (.38)	1.53 (.51)	-.30**	1.75 (.44)	1.53 (.51)	.23*
EE	2.80 (.72)	2.77 (.76)	.03	2.80 (.72)	2.56 (.75)	.25	2.77 (.76)	2.56 (.75)	.22
Father smoking	.24 (.43)	.28 (.45)	-.04	.24 (.43)	.28 (.45)	-.04	.28 (.45)	.28 (.45)	.00
Mother smoking	.24 (.43)	.31 (.47)	-.07	.24 (.43)	.33 (.47)	-.09	.31 (.47)	.33 (.47)	-.02
Sibling smoking	.13 (.34)	.26 (.44)	-.13	.13 (.34)	.50 (.51)	-.37***	.26 (.44)	.50 (.51)	-.24*
Friends smoking	-.51 (.53)	-.29 (.69)	-.13	-.51 (.53)	.66 (.81)	1.17***	-.29 (.69)	.66 (.81)	-.95***
Friends approval	2.21 (.95)	2.75 (1.05)	-.54	2.21 (.95)	3.45 (1.04)	-1.24***	2.75 (1.05)	3.45 (1.04)	-.70**
IOS	1.04 (.21)	1.28 (.61)	-.24	1.04 (.21)	2.56 (1.11)	-.78***	1.28 (.61)	2.56 (1.11)	-.55***
Prevalence estimates	3.74 (.53)	3.72 (.52)	.02	3.74 (.53)	3.73 (.55)	.01	3.72 (.52)	3.73 (.55)	-.01
Offers	1.85 (.92)	2.38 (.84)	-.53**	1.85 (.92)	3.50 (1.11)	-1.65***	2.38 (.84)	3.50 (1.11)	-1.12***
Marketing exposure	1.61 (1.44)	2.24 (1.10)	-.62*	1.61 (1.44)	2.83 (1.08)	-1.21***	2.24 (1.10)	2.83 (1.08)	-.59

Table 9

Pairwise Comparisons of all Variables entered in a Discriminant Function Analyses for Ages 15 to 20 using Bonferroni Adjustment.

Predictor Variables	Never and Initiation			Never and Experimentation			Initiation and Experimentation		
	Never Mean (SD)[a]	Initiation Mean (SD)	Mean Difference	Never Mean (SD)	Experimentation Mean (SD)	Mean Difference	Initiation Mean (SD)	Experimentation Mean (SD)	Mean Difference
Self esteem	4.15 (.82)	3.97 (.84)	.19	4.15 (.82)	3.68 (1.05)	.48*	3.97 (.84)	3.68 (1.05)	.29
Risk-taking	2.93 (.90)	3.00 (.73)	-.07	2.93 (.90)	3.20 (.91)	-.27	3.00 (.73)	3.20 (.91)	-.20
Efficacy	1.30 (.55)	1.56 (.79)	-.25	1.30 (.55)	2.73 (1.20)	-1.42***	1.56 (.79)	2.73 (1.20)	-1.17***
Drug use	1.37 (.53)	2.10 (.96)	-.73***	1.37 (.53)	2.93 (.94)	-1.56***	2.10 (.96)	2.93 (.94)	-.83***
Truancy	1.61 (3.05)	1.79 (2.55)	-.18	1.61 (3.05)	2.65 (3.05)	-1.04	1.79 (2.55)	2.65 (3.05)	-.86
Attitudes	1.74 (.74)	2.05 (.80)	-.31	1.74 (.74)	3.18 (.84)	-1.44***	2.05 (.80)	3.18 (.84)	-1.13***
Intention to smoke	1.17 (.49)	1.38 (.64)	-.20	1.17 (.49)	1.83 (.96)	-1.38***	1.38 (.64)	1.83 (.96)	-1.17***
Social beliefs	1.61 (.65)	1.74 (.87)	-.13	1.61 (.65)	1.95 (.81)	-.34	1.74 (.87)	1.95 (.81)	-.21
Health beliefs	1.50 (.66)	1.77 (.80)	-.27	1.50 (.66)	2.05 (.93)	-.55**	1.77 (.80)	2.05 (.93)	-.28
Psychological beliefs	1.50 (.62)	1.77 (.76)	-.27	1.50 (.62)	2.50 (.88)	-1.00***	1.77 (.76)	2.50 (.88)	-.73***
PRA	2.07 (.10)	2.25 (.83)	-.18	2.07 (.10)	2.70 (.82)	-.63**	2.25 (.83)	2.70 (.82)	-.45*
KHR	2.61 (1.14)	2.69 (1.29)	-.08	2.61 (1.14)	2.60 (1.26)	.01	2.69 (1.29)	2.60 (1.26)	.09
Availability	3.39 (1.37)	4.00 (1.04)	-.61*	3.39 (1.37)	4.13 (1.28)	-.73*	4.00 (1.14)	4.13 (1.28)	-.13

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

IOS = Influence others to smoke PRA = Personal risk awareness

KHR = Knowledge health risks

Table 10

Mean Differences and Significance for Pairwise Comparisons for Age Groups 10 to 14 and 15 to 20.

Predictor Variables	Never and Initiation		Never and Experimentation		Initiation and Experimentation	
	Ages 10 to 14	Ages 15 to 20	Ages 10 to 14	Ages 15 to 20	Ages 10 to 14	Ages 15 to 20
	Mean Differences		Mean Differences		Mean Differences	
Parent bonding	.02	.04	.63***	.16	.63***	.12
School bonding	.09	.18	.59**	.26	.51*	.08
Friend bonding	-.13	-.06	.25	-.18	.11	-.12
Girlfrirend/Boyfriend	.24*	.08	.28**	-.30**	.04	.23*
Educational expectations	-.03	.03	.22	.25	.26	.22
Father smoking	-.35***	-.04	-.35**	-.04	.00	.00
Mother smoking	-.15	-.07	-.35**	-.09	-.20	-.02
Sibling smoking	-.20*	-.13	-.40***	-.37***	-.20	-.24
Friends smoking	-.42**	-.13	-1.19***	1.17***	-.77***	-.95***
Friends approval	-.70***	-.54	-1.65***	-1.24***	-.95***	-.70**
Influence others to smoke	-.21	-.24	-.81***	-.78***	-.60**	-.55***
Prevalence estimates	-.20	.02	.59***	-.01	-.39*	-.01
Offers	-.45*	-.53**	-1.45***	-1.65***	-1.45***	-1.12***
Marketing exposure	-.87***	-.62*	-1.74***	-1.21***	-.87**	-.59

Table 10

Mean Differences and Significance for Pairwise Comparisons for Age Groups 10 to14, and 15 to 20.

Predictor Variables	Never and Initiation		Never and Experimentation		Initiation and Experimentation	
	Ages 10 to 14	Ages 15 to 20	Ages 10 to 14	Ages 15 to 20	Ages 10 to 14	Ages 15 to 20
	Mean Differences		Mean Differences		Mean Differences	
Self-esteem	-.13	.19	.73***	.48*	.86***	.29
Risk-taking	-.31	-.07	-1.00***	-.27	-.73*	-.20
Efficacy	-.05	-.25	-.83***	-1.42***	-.96*	-1.17***
Drug use	-.20	-.73***	-.90***	-1.56***	-.90*	-.83***
Truancy	.02	-.18	-.63*	-1.04	-.90*	-.86**
Attitudes	-.06	-.31	1.40***	-1.44***	-1.46*	-1.13***
Intention to smoke	-.21	-.20	-1.19***	-1.38***	-1.17*	-1.17***
Social beliefs	-.40*	-.13	-.83***	-.34	-.41*	-.21
Health beliefs	-.12	-.27	-.35	-.55**	-.36	-.28
Psychological beliefs	-.26	-.27	-.79***	-1.00***	-.67*	-.73***
Personal risk awareness	.00	-.18	-.37	-.63**	-.49	-.45*
Knowledge health risks	-.58	-.08	-.08	-.01	.47	.09
Availability	-.60	-.61*	-.97*	-.73*	-.50	-.13

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

Table 11

Results of Discriminant Function Analyses of Summarized Data for Both Age Groups

Predictor Variables	Ages 10 to 14 Loading Matrix* 1	2	F (2, 138)	Ages 15 to 19 Loading Matrix* 1	2	F (2, 179)
Factor 1 (DSI)	.66	.05	42.36***	.59	.66	36.74***
Factor 2 (BAB)	.47	-.16	21.06***	.54	-.46	30.41***
Sibling smoking	.39	.10	14.55***	.26	.46	7.58***
Girlfriend/Boyfriend	-.25	-.31	7.29***	-.28	.01	8.15***
Father smoking	.24	.39	7.29***	.06	.11	.35
Mother smoking	.27	-.02	7.13***	.08	.24	.69
Health risks	.05	.51	3.41*	.09	.03	.76
Factor 3 (SB)	-.09	.46	3.40*	-.01	.10	.02
Personal risk awareness	.16	-.18	2.76	.33	-.28	11.81***
Canonical R	.76	.39		.73	.13	
Eigenvalue	1.39	.18		1.17	.02	

* Pooled within group correlations of predictor variables with discriminant functions
***p<.001 ** p <.01 * p<.05
DSI = Deviance and Social Influence
BAB = Beliefs, Attitudes and Behavior
SB = Social Bonding

Table 12

Results of Discriminant Function Analyses for the Three Transitions

	Non-Smoking Loading Matrix[a]		Initiation/Experimentation Loading Matrix		Maintenance Loading Matrix	
Predictor Variables	l	F (1, 83)	l	F (1, 81)	l	F (1,35)
Family smoke	.69	10.04**	--	--	--	--
GB	-.51	5.56*	-.29	3.92*	--	--
Friends approval	.50	5.33*	.38	7.14**	--	--
Friends smoking	.47	4.75*	.45	9.79**	--	--
Marketing exposure	.47	4.67*	--	--	--	--
Age	-.06	.07	-.20	1.92	.32	2.63
Attitude	--	--	.80	31.17***	--	--
Intention	--	--	.63	18.90***	--	--
PsyB	--	--	.47	10.51*	--	--
Self-esteem	--	--	-.38	6.82**	--	--
ERO	--	--	.38	6.79*	--	--
Mother smoking	--	--	.30	4.39*	--	--
IOS	--	--	.35	5.74*	.79	5.32*
Social Beliefs	--	--	.28	3.82*	--	--
Prevalence	--	--	--	--	-.53	4.66*
Number Cigarettes	--	--	--	--	-.42	4.42*
Canonical R	.45		.61		.65	
Eigenvalue	.26		.59		.73	

[a] Pooled within group correlations of predictor variables with discriminant functions

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

GB = Girlfriend/ Boyfriend PsyB = Psychological beliefs

ERO = Efficacy to refuse offers IOS = Influence others to smoke

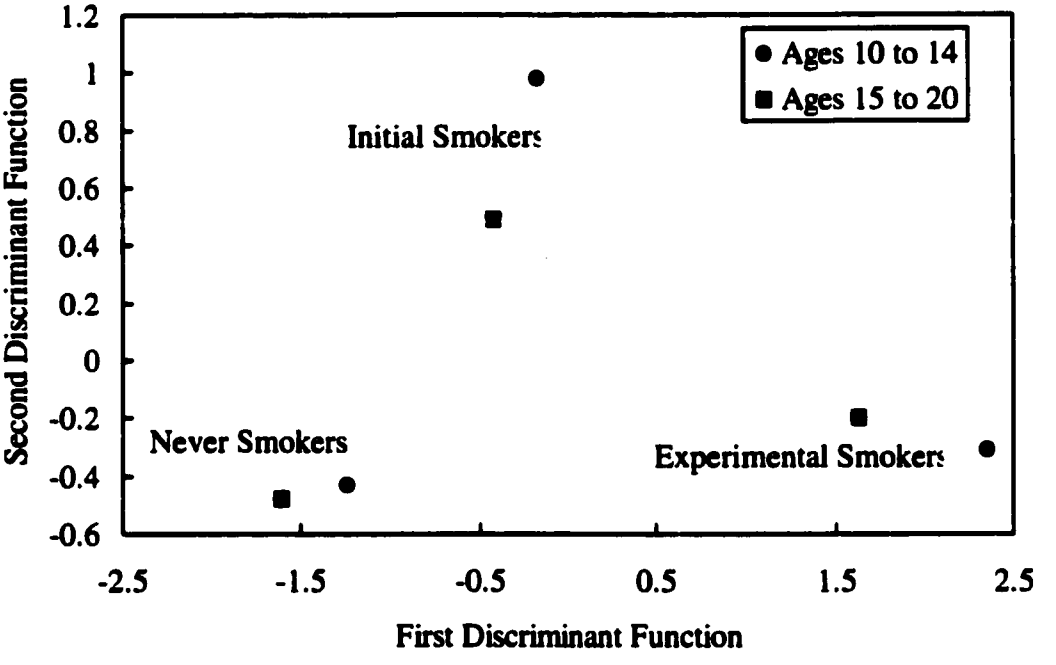
Table 13

Classification Matrix for Three Transitions within the Smoking Onset Process.

Actual Group Membership	Predicted Group Membership	
Non-Smoking[a]		
	Remain Nonsmokers	Initiate Smoking
Remain Nonsmokers	56 (93%)	4 (7%)
Initiate Smoking	14 (56%)	11 (44%)
	Percent of grouped cases correctly classified: 78%	
Initiation/Experimentation[b]		
	Maintain Status	Increase
Maintain Status	31 (82%)	7 (18%)
Increase	10 (22%)	36 (78%)
	Percent of grouped cases correctly classified: 80%	
Maintenance[c]		
	Maintain Status	Decrease
Maintain Status	22 (92%)	3 (8%)
Decrease	6 (23%)	7 (77%)
	Percent of grouped cases correctly classified: 86%	

[a] n = 85
[b] n = 84
[c] n = 37

Figure 1. Plots of six groups centroids, for both age groups, on two discriminant functions derived from raw data.



Appendix A

Below are questions about adolescent behaviors. Read each question carefully and give the most honest ;ponse you can. No one else will read your answers. There is no time limit for completing the questionnaire, but s best to work as quickly as you are comfortable with. There are no right or wrong answers.

:ase answer the following questions:

Your gender: ___ Male ___ Female

Date of Birth: ___ Month ___ Day ___ Year

Are you: ___ Caucasian ___ African ___ Native ___ Canadian ___ Other

If other, please specify: _____

Who do you live with? ___ Both parents ___ Single parent ___ Other

If other, please specifiy: _____

Do you have a stepmother? ___ Yes ___ No

Do you have a stepfather? ___ Yes ___ No

How many siblings do you have? ___ Brothers ___ Sisters

How many older siblings do you have? ___ Brothers ___ Sisters

. How many younger siblings do you have? ___ Brothers ___ Sisters

. How much money do you have to spend on yourself each week?_____dollars

. Which school will you be attending next year? _____

. What grade will you be in next year? _____

. Do you have a boyfriend/girlfriend? ___ Yes___ No

. How many days of school have you missed in the last 30 days because you skipped or cut class? _____days

. My mother completed: ___ Grade school or less
___ High school
___ College
___ University
___ Graduate or professional school

. My father completed: ___ Grade school or less
___ High school
___ College
___ University
___ Graduate or professional school

. What level do you expect to complete in school: ___ Grade school or less
___ High school
___ College
___ University
___ Graduate or professional school

). How do you think you are doing in your school work? ___ Very well
___ Quite well
___ Average
___ Not very well
___ Badly

). Are you involved in any extracurricular activities? ___ Yes ___ No

If yes, please name these activities: _____ _____

_____ _____

1. Do you watch sports on television? ___ Yes ___ No

If yes, which sports do you like to watch the most? _____

_____

_____

_____

2. Of your five closest friends, how many smoke? _____

3. Can you name a brand or type of cigarette? ___ Yes ___No

If yes, which ones? _____ _____ _____

24. Do you have a favorite cigarette advertisement ___ Yes ___ No

If so, what is it: _____

25. Please name as many health risks of smoking as you can:

a _____ c _____ e _____

b _____ d _____ f _____

26. How often have you smoked a cigarette?

___ never
___ tried them but don't smoke now
___ experimented occasionally with them but don't smoke now
___ used them regularly but don't smoke now
___ less than once a month
___ about once a month
___ a few times a month
___ about once a week
___ a few times a week
___ about once a day
___ few times a day
___ about half a pack a day
___ a pack or more a day

27. If you have smoked a cigarette at any time, how old were you when you had your first cigarette? _____ years old

B. Now please read each of the following statements and decide how much you agree or disagree. For each statement, circle the number that describes your opinion. Remember to circle only one of the 5 choices for each statement.

	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree
1. I am satisfied with school	1	2	3	4	5
2. I have many friends	1	2	3	4	5
3. Smoking cigarettes lets you have more fun	1	2	3	4	5
4. I will smoke when I leave school for good	1	2	3	4	5
5. Smoking causes bronchitis	1	2	3	4	5

	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree
6. I really care about my parents	1	2	3	4	5
7. Smoking helps you escape from problems	1	2	3	4	5
8. My school has strict rules about smoking	1	2	3	4	5
9. Smoking causes heart disease	1	2	3	4	5
10. It would be very difficult to refuse a cigarette offered by friends	1	2	3	4	5
11. My parents discipline me when I do something wrong	1	2	3	4	5
12. It would be easy to refuse an offer for a cigarette	1	2	3	4	5
13. Smoking gives you confidence	1	2	3	4	5
14. I feel that I can't do anything right	1	2	3	4	5
15. Smoking keeps your weight down	1	2	3	4	5
16. Smoking is a waste of money	1	2	3	4	5
17. If I were asked, I would tell people I was strongly against smoking	1	2	3	4	5
18. Life with no danger would be dull for me	1	2	3	4	5
19. I enjoy spending time with my friends	1	2	3	4	5
20. Smoking makes you feel good	1	2	3	4	5
21. I feel that my life is not very useful	1	2	3	4	5
22. I would have more friends if I smoked	1	2	3	4	5
23. I have many friends who are female	1	2	3	4	5
24. Smoking helps you to relax	1	2	3	4	5

	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree
25. I enjoy doing school work	1	2	3	4	5
26. The adult I admire the most would mind if they saw me smoking	**1**	**2**	**3**	**4**	**5**
27. I obey my parents	1	2	3	4	5
28. We discuss smoking in class/school	**1**	**2**	**3**	**4**	**5**
29. I enjoy fast driving	1	2	3	4	5
30. Smoking bothers me	**1**	**2**	**3**	**4**	**5**
31. You will lose friends if you don't smoke	1	2	3	4	5
32. On the whole, I am satisfied with myself	**1**	**2**	**3**	**4**	**5**
33. I really care about my friends	1	2	3	4	5
34. Smoking causes lung cancer	**1**	**2**	**3**	**4**	**5**
35. My best friend would mind if they saw me smoking	1	2	3	4	5
36. I often bring school work home with me	**1**	**2**	**3**	**4**	**5**
37. I usually feel good about myself	1	2	3	4	5
38. It would be very difficult to refuse an offer for a cigarette	**1**	**2**	**3**	**4**	**5**
39. I will smoke one year from now	1	2	3	4	5
40. Smoking makes you smelly	**1**	**2**	**3**	**4**	**5**
41. My mother and I talk quite often	1	2	3	4	5
42. Smokers live a long life	**1**	**2**	**3**	**4**	**5**
43. I spend a lot of time talking to my friends after school	1	2	3	4	5

	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree
44. I wish people would stop smoking	1	2	3	4	5
45. It would be very difficult not to smoke when my friends are smoking	1	2	3	4	5
46. I feel I do not have much to be proud of	1	2	3	4	5
47. Smokers live a healthy life	1	2	3	4	5
48. I would refuse a cigarette even if I was being called a coward	1	2	3	4	5
49. Sometimes I think that I am no good	1	2	3	4	5
50. Most of my friends are in favour of smoking	1	2	3	4	5
51. Smoking calms your nerves	1	2	3	4	5
52. **People my age smoke to show off**	1	2	3	4	5
53. I know many reasons to refuse a cigarette	1	2	3	4	5
54. Smoking cigarettes makes you look cool	1	2	3	4	5
55. I am strongly against smoking	1	2	3	4	5
56. Smoking makes you get out of breath easily	1	2	3	4	5
57. My friends and I meet a lot after school	1	2	3	4	5
58. I like to take chances more than other people my age	1	2	3	4	5
59. I have many friends	1	2	3	4	5
60. You will be left out of the group if you don't smoke	1	2	3	4	5
61. I have tried or do try to influence my friends to smoke	1	2	3	4	5

	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree
62. Older kids would like me more if I smoked	**1**	**2**	**3**	**4**	**5**
63. My family has a lot of fun together	1	2	3	4	5
64. My friends really care about me	**1**	**2**	**3**	**4**	**5**
65. It is easy to get a pack of cigarettes if I want one	1	2	3	4	5
66. My father and I talk quite often	**1**	**2**	**3**	**4**	**5**
67. Smoking causes coughs	1	2	3	4	5
68. Most of my friends are against smoking	**1**	**2**	**3**	**4**	**5**
69. I am able to do things as well as most other people my age	1	2	3	4	5
70. Smoking looks tough	**1**	**2**	**3**	**4**	**5**
71. I am committed to school	1	2	3	4	5
72. My parents really care about me	**1**	**2**	**3**	**4**	**5**
73. Compared toother parents, my parents are are very strict with me	1	2	3	4	5
74. I have many friends who are male	**1**	**2**	**3**	**4**	**5**

C. Below are some more statements. Read each question and decide whether it is true or false. Circle "T" fo statements that are true and "F" for statements that are false. Remember to circle only one of the two choice for each statement.

1. My father smokes	**T**	**F**
2. I have a brother who smokes	**T**	**F**

3. **I have a sister who smokes** ..... T F

4. My best friend smokes cigarettes ..... T F

5. **I have a stepmother who smokes** ..... T F

6. I have a stepfather who smokes ..... T F

7. **My mother smokes** ..... T F

8. One of my parents has offered me a cigarette in the past ..... T F

9. **I have an older brother who smokes** ..... T F

10. I have an older sister who smokes ..... T F

11. **I have more than one sister who smoke** ..... T F

12. I have more than one brother who smokes ..... T F

D. Read each of the following statements and rate them using the scale below. For each statement, circle the number that describes your opinion. Remember to circle only one of the 5 choices for each statement.

	1 Almost None	2 Very Little	3 Some	4 Quite Alot	5 Almost All
1. How many females do you think smoke?	1	2	3	4	5
2. How many students in your school year do you think smoke?	**1**	**2**	**3**	**4**	**5**
3. What are the chances that someone like yourself would die from a stroke?	1	2	3	4	5
4. How many people do you think smoke?	**1**	**2**	**3**	**4**	**5**
5. How many students in your class do you think smoke?	1	2	3	4	5
6. How many peers from your age group do you think smoke?	**1**	**2**	**3**	**4**	**5**

	1 Almost None	2 Very Little	3 Some	4 Quite Alot	5 Almost All
7. How many adults do you think smoke?	1	2	3	4	5
8. What are the chances that someone like yourself would die from emphysema?	**1**	**2**	**3**	**4**	**5**
9. How many teachers do you think smoke?	1	2	3	4	5
10. How many of your friends smoke?	**1**	**2**	**3**	**4**	**5**
11. What are the chances that someone like yourself would die from cancer?	1	2	3	4	5
12. How many males do you think smoke?	**1**	**2**	**3**	**4**	**5**

E. For each statement, circle the number that describes your opinion. Remember to circle only one of th choices for each statement.

	1 Almost None	2 Very Little	3 Some	4 Quite Alot	5 Almost All
1. How often have you used each of these chemicals to get high:					
1a. Beer	**1**	**2**	**3**	**4**	**5**
1b. Wine	1	2	3	4	5
1c. Hard Liquor (whiskey, vodka, gin, etc) or mixed drinks	**1**	**2**	**3**	**4**	**5**
1d. Tranquilizers	1	2	3	4	5
1e. Quaaludes (ludes, scopers) or downers (reds, blues, yellows, barbs)	**1**	**2**	**3**	**4**	**5**
1f. Inhalants (gasoline, glue, aerosol, sprays) amylnitrate or butylnitrate (poppers, rusic, locker room, etc)	1	2	3	4	5

	1 Almost None	2 Very Little	3 Some	4 Quite Alot	5 Almost All
1g. Cocaine (coke, crack, rock)	1	2	3	4	5
1h. PCP (angel dust, peace pill), LSD (acid), or other psychedelics	1	2	3	4	5
1i. Heroin (horse, smack) or other opiates (methadone, opium, morphine, codeine, etc)	1	2	3	4	5
1j. Marijuana (grass, pot), or hashish	1	2	3	4	5
1k. Stimulants (uppers, speed, diet pills)	1	2	3	4	5
1l. Shaving lotion, cough medicine, mouth wash, vanilla extract, or anything	1	2	3	4	5
2. How often are you offered cigarettes?	1	2	3	4	5
3. How often do you do something that is not safe just for excitement?	1	2	3	4	5
4. How often do your brother(s) offer you cigarettes?	1	2	3	4	5
5. How often do older people buy cigarettes for you?	1	2	3	4	5
6. How often do your parents offer you cigarettes?	1	2	3	4	5
7. How often do you see staff smoking in staff rooms or around the school?	1	2	3	4	5
8. If someone dared you to do something dangerous, how often would you take the dare?	1	2	3	4	5
9. How often do your friends/acquaintances offer you cigarettes?	1	2	3	4	5
10. How often do your sister(s) offer you cigarettes	1	2	3	4	5

F. If you smoke at least once a month, please answer the following questions as honestly as possible.

1. How long have you been smoking? ___ years

1. Do you smoke to get a high or feel excited? ___ yes ___ no

2. Do you smoke because it gives you something to do with your hands? ___ yes ___ no

3. Do you inhale? ___ yes___ no

4. Have you ever tried to purchase cigarettes? ___ yes ___ no

   If yes, are you asked for I.D. when you try and purchase cigarettes? ___ yes ___ no

5. Have you ever tried to buy a pack of cigarettes at a store and been refused? ___ yes ___ no

6. Do you smoke to feel relaxed? ___ yes___ no
7. Do you plan to quit smoking within the next year? ___ yes ___ no

8. Do you smoke because you like having a cigarette in your mouth? ___ yes ___ no

9. Do you smoke when you feel nervous or tense? ___ yes ___ no

10. Is smoking a habit? ___ yes ___ no

11. Do you have cravings for cigarettes? ___ yes ___ no

12. Do you find it difficult not to smoke in places where it is not allowed (i.e church and school)? ___ yes ___ no

G. If you smoke at least once a day, please answer the following questions as honestly as possible.

1. How many cigarettes a day do you smoke?

___ over 25 cigarettes a day
___ about 21-25 cigarettes a day
___ about 16-20 cigarettes a day
___ about 11-16 cigarettes a day
___ about 6-10 cigarettes a day
___ about 1-5 cigarettes a day
___ less than 1 a day

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

___ within the first 30 minutes
___ more than 30 minutes after waking up, but before noon
___ in the afternoon
___ in the evening

3. Which cigarette would you hate to give up?

___ first cigarette in the morning
___ any other cigarette before noon
___ any other cigarette in the afternoon
___ any other cigarette in the evening
___ last one before going to bed

5. Do you smoke more during the first 2 hours after waking than during the rest of the day? ___ yes ___ no