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Smoking and Stress: Exploring Patterns Among High School Youth in Bulgaria

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SMOKING AND STRESS:

EXPLORING PATTERNS AMONG HIGH SCHOOL YOUTH IN BULGARIA

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Abstract

Bulgaria has recently emerged as one of the countries characterized by strikingly high death rates due to stroke, heart disease and different types of cancer. No serious attempt at dynamic analysis of the behavioral factors contributing to these high disease rates exists. It is clear that in order for this trend to be changed, the group within the age range of onset of most unhealthy behaviors needs to receive special attention. These facts and the lack of systematic exploration of the behavioral health risks of adolescents underline the importance of the proposed study.

The project had three goals: 1/ Measurement development and validation of smoking cessation, smoking prevention and stress related measures for Bulgarian adolescents; 2/ exploration of factors associated with smoking cessation and prevention in the same population; 3/ applied comparison of logistic regression analysis and discriminant function analysis for models with binary outcomes. In the total sample recruited from 12 high schools in Bulgaria (N=673), 276 (41.0%) participants were classified as smokers and quitters and 369 (54.8%) were nonsmokers. Measures with good psychometric properties were developed for decisional balance (DB) and self-efficacy (SE) for smoking cessation and prevention among ever smokers and nonsmokers respectively. The stage distributions of all measures confirmed theoretical predictions. Thus the validity of these TTM constructs for the Bulgarian adolescent population was supported. Two stress measures were also validated in the sample. These validated measures can be used with confidence in future research.

A series of logistic regression and discriminant function analyses were performed to explore the factors associated with smoking behavior. Smoking status was

operationalized in a variety of ways in an attempt to differentiate between the factors related to smoking initiation, progression to regular smoking and smoking cessation. Attitude towards smoking bans was the single predictor that was retained across all models. In addition factors that differentiated between current smokers and ex-smokers were age, smoking status of family members and temptation to smoke. Nonsmokers at risk were differentiated from committed nonsmokers by scores on pros of staying smoke free, temptations and belief that smoking is harmful to health. Variables that distinguished between smokers and nonsmokers were age, GPA, smoking status of sibling and friends and beliefs that smoking is harmful to health. These data failed to provide evidence for a relationship between levels of perceived stress and smoking behavior, contrary to expectations. These results provide some insight into the factors that need to be considered when smoking cessation and prevention programs for this population are developed.

Logistic regression and discriminant function analysis on data with binary outcomes resulted in models with comparable overall classification rates. For models with very different group sample sizes and equal prior probabilities, however, the logistic regression models had lower sensitivity. The logistic regression procedure demonstrated more sensitivity to the choice of classification threshold than DFA did in these data. Researchers should take this characteristic into account when selecting a method for analysis, since it strongly influences classification results.

Preface

The presentation of this dissertation is organized into separate chapters following a manuscript format that facilitates future paper submission, however, entails some redundancy for the reader. The measurement development work for the Decisional Balance and Self-efficacy for smokers is presented in Chapter 2 and for nonsmokers in Chapter 3. In addition Chapter 4 presents the results of the validation of the stress scales used in the study. The results for the analyses on prediction of smoking status are presented in Chapter 5, the logistic and DFA models for smokers are presented in Chapter 6 and the logistic and DFA analyses for nonsmokers is in Chapter 7. Finally the general conclusions, limitations and direction for future work are presented in Chapter 8.

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Chapter 1. Introduction

Statement of the problem

Bulgaria is a small Eastern European country in the less developed Balkan region of the European continent. On health maps Bulgaria has recently emerged as one of the countries characterized by strikingly high death rates due to stroke, heart disease and different types of cancer. The death rate due to cardiovascular disease was four times higher than the average for Europe and the death rate due to cancer has shown an increasing trend as compared to the decrease reported for other European countries (WHO, 2001). A number of explanations for this phenomenon have been proposed, but all of them have been based on outside analysis of general statistical data. No serious attempt at dynamic analysis of the behavioral factors contributing to these high disease rates exists. It is clear that in order for this trend to be changed, the group within the age range of onset of most unhealthy behaviors needs to receive special attention. The sharp increase in the use of psychoactive substances among adolescents in Bulgaria in the years after the fall of the communist regime in 1989 (Anguelov, Petkova & Lazarov, 1999), as well as the additional burden of stress, related to a changing economy and restructuring of major social institutions (including the educational and health systems) puts additional burden on the young people in Bulgaria (Botcheva, Feldman, Liederman, 2002). These facts and the lack of systematic exploration of the behavioral health risks of adolescents underline the importance of the proposed study. Special attention will be focused on smoking because relatively little attention is paid to this problem and its prevalence among adolescents, despite the evidence of overwhelming adverse health effects from tobacco use.

The constructs of the Transtheoretical model of behavior change (TTM) - a well-established paradigm in the field of behavioral health psychology – was adopted and used in the study. The model approaches the study of behavioral change through description of stages of readiness to change specific behavior and the accompanying processes and outcomes (Prochaska & DiClemente, 1983). Research evidence from a large number of studies suggests that individuals move through a series of changes, while attempting to quit unhealthy behaviors (e.g. smoking) or acquire healthy ones (e.g. exercise) (Prochaska, 1994). While progressing through these stages, individuals also utilize a number of behavioral, cognitive and experiential constructs, such as decisional balance and self-efficacy, which also help determine individuals' readiness to change.

The goal of this dissertation was to adapt and develop model-based questionnaires for assessing the smoking attitudes and behavior of teenagers in Bulgaria and examine their connection with levels of stress and coping skills in this group. The measures are based on those developed for US teenagers based on the Transtheoretical model of behavior change (TTM). The major strengths of the project are its focus on an understudied population at high risk and its potential for future development into an effective intervention for this group.

Justification for and significance of the study

Health crisis in Eastern Europe

In western countries over the last 20 years there has been a steady decline in the smoking prevalence rate and consumption of cigarettes, accompanied by increasing efforts to control tobacco usage through bans on smoking in public places, taxation, health promotion,

prohibiting sales to minors and variety of smoking cessation programs (Fava, Velicer, & Prochaska 1995). At the same time smoking rates in Central and Eastern Europe have been increasing, leading to a rapid rise in premature mortality of middle aged men, due mainly to cancer, stroke and cardiovascular disease (Corrao, Guindon, Sharma, & Shokoohi, 2000). This rapid rise is described as an epidemic in the region. A number of studies have attempted to explain the major causes for this phenomenon. (Bresch 1997; Kubik, et al., 1995,Watson 1995, Feaechem 1994), but definitive causal explanations have not been provided in the scarce literature, although some important observations should be mentioned.

As this rise in premature mortality was caused mainly by chronic illnesses belonging to the group of preventable diseases, the traditional behavioral factors of smoking, calorie intake, alcohol consumption and sedentary lifestyle have been examined as likely causes. Not surprisingly the trend towards a sharp increase in cigarette consumption starting in the sixties and continuing through the nineties among males in the region (Kubik et al., 1995) led to increases in the mortality due to lung cancer. This trend was especially noticeable in the countries that had low levels of cigarette consumption in the beginning of the period, such as Bulgaria and East Germany, but reached alarmingly high rates of mortality (about 40%) due to lung cancer attributed to tobacco in the late eighties.

Even though the role of increasing tobacco consumption in the observed death rates is undeniable and widely accepted, some authors maintain that this factor alone cannot be responsible for the epidemic (Bresch, 1997; Ginter, 1998). Paradoxically the review of the other traditional risk factors for heart disease - fat and alcohol consumption - found comparable levels in the East and West countries and even favorable readings for the East countries in some regards. For instance, although the consumption of meat and animal fat had

more than doubled in Bulgaria in the period from 1950 to 1990, it never reached the levels reported in the United States (Bresch, 1997). These observations indicate that the traditional risk factors for cardiovascular disease, with the exception of smoking, seem to be poor indicators for mortality rate in the region (Watson, 1995). A number of alternative hypotheses have also been offered to explain these high mortality rates. A possible explanatory factor was the lower economic development of the region. Many studies have shown the link between wealth and health, but according to their wealth indicators Eastern European countries should be enjoying much better population health. The average mortality risk of 28% for the region is similar to the figures for much poorer countries in the Middle East and North Africa (23%) (Faechem, 1994). These numbers indicate that although the economic situation in Eastern Europe does contribute to the decline in health, it alone cannot account for the great disparities of health indices with the West.

In a similar way, the environmental pollution and health care systems have been blamed, but when the data is examined, it reveals that these indicators do not drastically differ for the Western and Eastern parts of Europe, and therefore cannot be singled out as major causes. For example, according to study results Eastern countries had lower levels of nitrogen oxide of vehicle emissions (Watson, 1995).

Poor health care has also been identified as a risk factor (Bresch, 1997). It is true that the efficiency of the health system and the quality of equipment has been poorer in the East and recent health system reforms worsened the situation in many counties. At the same time comparable numbers of health specialists and doctors have been reported for both regions (Dimitrakov, 1996). So it seems that the poor health care efficiency alone cannot account for

the increasing death rates, especially when the gender specificity of the phenomenon is taken into account (Cockerham, 1999).

As traditional risk factors could not completely account for the development of the health crisis in the region, some authors turned to the examination of the specific "psychosocial factors" (Watson, 1995) that could provide some increased understanding of the problem and point towards development of prevention programs. Such attention is well justified when the specific development of the countries in the region is taken into consideration. After World War II all the countries in the region were drastically converted into communist states with characteristic totalitarian economic and political systems. This led to the establishment of a "toxic psychosocial environment" (Ginter, 1997), characterized by lack of personal perspective, chronic stress, anger, hostility and apathy. Important indicators of the influence of these factors are the development of a "divided personality", and high suicide rates (Health for all, 1997). The transition to a democratic political system and market economy in the early nineties, although positive changes in the long run, brought new stresses to the population such as high rates of unemployment, high levels of insecurity and uncertainty and a great sense of disillusionment with the political system (Watson, 1995). All these changes and the resulting psychosocial climate might be important moderators, which also help to explain the deteriorating health in the region and the epidemic of stroke and cardiovascular disease.

This review suggests that with the significant exception of smoking, traditional risk factors alone cannot fully explain the high prevalence of preventable chronic diseases in the region. Although psychosocial factors leading to stress may be important, some important differences across countries exist. Effective prevention and intervention programs in the

region need to address the high tobacco consumption in the region and take into account the specifics of each country. This type of research is very scarce.

The case of Bulgaria

Bulgaria has also followed this pattern of deteriorating health and increases in cigarette consumption in the region. Percentages of smokers have reached alarmingly high levels among men (49.2%), adolescents (24% for males and 31% females) and even health professionals (52.3%) (Corrao et al., 2000). According to other sources these figures are even higher, reaching 61.1% smoking prevalence among male population (Uitenbroek, 1996) and 36% among adolescents (Shafey, Dolwick & Guindon, 2003) and the trend is for further increase. At the same time the mortality rate for the population shows a steady increase in the last decade with invariably increasing numbers in the leading cause of death – cardiovascular diseases (Ginter, 1997). The role of tobacco consumption in this health problem is acknowledged by the Ministry of Health in Bulgaria, which included smoking as one of the priority challenges the country needs to face in its health strategy until year 2010. High and steady levels among men, steady increase in the levels among women and an aggressive invasion among youth of both genders characterize the problem of smoking rates in Bulgaria (Ministry of Health, 2001)

Some efforts have been made to control tobacco products in Bulgaria. Advertising and sales to minors are officially banned, but the lack of appropriate enforcement leads to very low effectiveness. The lack of efficiency of the imposed measures is well illustrated by the fact that 65.1% of students who smoke report that they buy their cigarettes freely in the store (GYTS, 2003). Smoking is prohibited in educational and health facilities, government buildings and public transportation but it is allowed and heavily practiced in all other public

places (restaurants, bars, pubs, clubs), which are often visited by youth and become a powerful channel for promotional activities for the tobacco companies (Shafey et al., 2003). As a large producer of tobacco, Bulgaria maintains very low prices of cigarettes of domestic brands ($0.40 average cost per pack), which has more than 90% of market share. This low cost facilitates easy access to tobacco products.

As a state in a transitional political and economic period, Bulgaria was unable to adequately counteract the tobacco industries and the growing health problem of smoking. Even though in the last two years main changes in tobacco related policy have been introduced (WHO, 2002; Ministry of Health, 2002), the support for health promotion activities, smoking prevention and educational activities in the last decade has been particularly weak (Balabanova, Bobak & McKee, 1998). The reports on some prevention strategies most often describe some pilot programs and prevention efforts (Anguelov et al., 1999) and short term campaigns such as "Quit and Win" (Tulevski & Vasilevski, 2000) and theme competitions "No to cigarettes" (Kotarov, 2002), performed as a part of an international campaign.

Overall this context does not provide many anti-tobacco messages, placing adolescents at high risk for smoking initiation and accompanying health hazards. Although unfortunate, this situation highlights the need for research to shed light on the specific needs of this population, so that effective, low cost smoking intervention and prevention programs can be developed.

Predictors of smoking initiation and cessation

Globally, smoking is one of the leading preventable causes of premature death, dramatically increasing the risk of cancer, heart disease and other health problems.

Tobacco accounted for more than four million annual deaths in 1998 and the estimates are that this number will double by the year 2020 (WHO, 2003). Smoking initiation for adult users usually occurs during adolescent years (Fiore, 1992) and smoking is unlikely to occur if it is not started during adolescence (US Surgeon General, 1994). At the same time it is estimated that around 50% of teenage youth that initiate smoking remain addicted for 16 to 20 years (Najem, Batuman, Smith, & Feuerman, 1997). Therefore the development of quality prevention programs for teenagers is very important.

Good smoking prevention programs require better understanding of the factors that influence smoking initiation and maintenance in adolescence. This need has given a rise to a substantial body of research into the psychosocial correlates of smoking, attempting to explain the mechanisms of smoking initiation (US Surgeon General, 2000). As Pederson et al. (1998) note, there are problems in interpreting and summarizing the results of these studies, due to differences in study designs, variety of measures and large variability of the combinations of included variables. Despite these inconsistencies there are a number of factors that emerge across a large number of the proposed models and thus allow for some more general statements (Pederson et al., 1998). Variables that have been consistently associated with smoking are stress (Byrne & Mazanov, 2003; Koval, Pederson, Mills, McGrady, & Carvajal, 2000; SiQuira, Diab, Bodian, & Rolnitzky, 2000; Wills, 1986; Weinrich, Hardin, Valois, & Gleaton, 1996,), coping strategies (McCubin, Needle, & Wilson, 1985; Siquierra et al., 2000; Vollrath, 1998;), self esteem (Glendinning & Inglis, 1999; Jackson & Henricksen, 1997; Kawabata, Shimai & Nishoka, 1998), peer influence (Griesler &Kandel, 1998; Jackson, 1997; Urberg, Cheng, & Shyu, 1991), risk taking (Coogan, 1998) and family influence (Piko, 2000; Proescholdbell, Chassin, & MacKinnon, 2000; Wang,

Fitzhugh, Westerfield, & Eddy, 1995). Although not so broadly studied, tobacco related marketing has also been often pointed out as a risk factor for smoking initiation (Unger, Cruz, Schuster, Flora, & Johnson, 2001) and could play an important role in a weakly regulated tobacco marketing environment.

Smoking and stress

Stress, measured in a variety of ways is consistently and repeatedly associated with smoking initiation and maintenance in adult and adolescent samples (Byrne, 1995, Mitic & McGuire, 1985; Debbie & Jeffery, 2003; Dugan et al; 1999; Pederson, et al., 2001; Sussman, Brannon, Dent, & Hansen, 1993; Wills 2002; Wills, 2002). Stress can be measured through the number of negative events occurring in a certain time period or through the subjective evaluation of a person who rates the degree of stress he or she experiences (Cohen, 1983). The latter approach to stress management follows the cognitive appraisal paradigm suggested by Lazarus and Folkman (1984). When the link between smoking and stress has been studied, this type of measure has been used most often since it involves the cognitive appraisal of the situation as stressful or not and leads to specific behavioral responses. This approach does not undermine the potential influence of negative life events, but rather allows for a better discrimination among individuals with different levels of coping skills.

The teenage years are the transition from childhood to adulthood, characterized as a time of increased anxiety, experimentation, risk taking and rebelliousness. Such a dynamic period leads to increased levels of stress and it is hypothesized that some adolescents may turn to smoking as a coping strategy (Mitic & McGuire, 1985). A number of studies support this hypothesis, showing that a perceived high level of stress is often mentioned as an important factor for starting to smoke among adolescents (Enomoto, 2000; Koval et al.,

2000). Among users, smoking is often described as a means for relaxation and search for positive emotions (Chabrol, et al. 2000), which allows smokers to view it as a coping mechanism. There is also evidence that smokers usually possess lower coping competence and use negative coping methods (anger and helplessness) compared to nonsmokers (Siqueira et al., 2000). The perception that smoking relieves stress is also one of the factors playing a major role in progression to regular smoking (Najem et al., 1997).

Although the correlation between smoking and stress is well documented, some controversy exists in the interpretation of these findings. The traditional interpretation of these reports presents increased stress as a risk factor for smoking initiation, thus assigning stress a causal position in the stress-smoking relation (Wills, 2002). Such an interpretation is also consistent with the reports of smokers that cigarettes help them reduce stress. At the same time, it has been suggested that the connection is found only in cross-sectional studies and was much weaker when assessed prospectively and is stronger for girls than for boys (Byrne & Mazanov, 2003). In addition the connection between stress and smoking leads to a paradox, pointed out by Nesbitt (1973): smokers report themselves as calmer when smoking, but their physiological arousal goes up. In an attempt to resolve this paradox, Parrot (1998, 1999) suggests an alternative interpretation of the consistent correlation between smoking and stress. According to his theory, smokers in fact experience higher levels of stress (Parott, 2000) and depression (Coogan et al., 1998) due to the negative effects of withdrawal symptoms added to their daily stress level. The perceived "benefits" of tobacco use by smokers are simply reversed unpleasant abstinence effects, which are not experienced by non-smokers (Parott & Kaye, 1999).

It is hard to resolve this controversy with existing data, as the majority of the reported studies are cross-sectional and do not allow for causal interpretations. One longitudinal study has been reported (Wills, 2002) that tested the directionality of the stress-smoking relation and did not find support for Parrot's hypothesis that smoking leads to increased stress. As the study was based solely on self-report measures, the results may only confirm a widespread belief of the stress-relieving functions of smoking or reflect the actual experience of smokers of reduced stress without identifying the causes for the experience of stress in the first place.

Even though the directionality of the stress – smoking relation cannot be determined, its existence is an important part of the smoking profile of a given population. The large number of studies evaluating this relationship for a variety of western country samples supports its importance. No comparable studies exist in the literature for Bulgarian adolescents and thus, this needs to be done.

Coping strategies

If smoking is so broadly perceived as a way to deal with stress, then a larger variety of coping strategies accompanied with confidence in successful coping skills should be negatively correlated with smoking initiation and positively correlated with smoking cessation. Research supports this statement. A number of studies have reported relationships between coping skills and smoking behavior (Castro, Maddahian, Newcomb, & Bentler, 1987; Rabois & Haaga, 2003; Koval & Pederson, 1999; Siqueira et al., 2000; Sussman et al., 1993). Sometimes coping skills are separated into positive (social support, cognitive processing) and negative (anger, helplessness) and positive skills are associated with lower risk of smoking (Loon, Tijhuis, Surtees & Ormel, 2001; Siqueira et al., 2000). Coping competency and self-efficacy play an important role in the

stress-smoking relationship (Fargan, Eisenberg, Frazier, Stoddard, Avrunin & Sorensen, 2003) and any study attempting to describe it needs to pay attention to these two factors. If teenagers are provided with alternative ways to cope with the stresses in their lives in addition to smoking prevention messages, better smoking prevention and cessation programs may be developed.

Tobacco Marketing Receptiveness

Pro-tobacco marketing campaigns have traditionally been associated with increased risk of smoking initiation among adolescents and other targeted populations. Anti-tobacco marketing campaigns have been relatively novel and built on a smaller budget. This led to increased interest in the mechanisms through which tobacco related marketing works.

The relation between increased smoking initiation and marketing campaigns of certain cigarette brands has been well documented. For instance, in 1980 smoking among adolescents increased after the introduction of Joe Camel (Pierce et al., 1991). Similar evidence has been reported for different brand names (Hastings, Ryan, Teer, & MacKintosh, 1994; O'Keefe & Pollay, 1996; Pierce and Gilpin, 1995,). These reports have been criticized for their correlational nature and for their choice of measures (Biener & Siegel, 2000; Pechmann, 2001). But an increasing number of longitudinal studies support this general finding and confirm the role of pro-tobacco marketing exposure as a risk factor in smoking initiation (Biener & Siegel, 2000, Choi, Ahluvalia, Harris, Okuyemmi, 2002). Due to the pervasiveness of tobacco slogans and advertising materials in the environment, a large percent of adolescents are exposed to them, but not all of those exposed become smokers. This fact suggests that further research into the mechanisms

through which tobacco marketing may work will be important. Some results to date suggest that receptivity to tobacco marketing messages, measured by ownership or desire to own and intention to use a tobacco promotional item is the best predictor of smoking initiation among adolescents (Unger et al., 2001; Biener & Siegel, 2000). It can be argued that increased levels of tobacco marketing would make a larger percentage of adolescents receptive to the messages, especially when they are specifically designed to target youth. In addition there is some evidence that tobacco marketing can undermine effective parenting styles that would normally play a preventive role (Pierce, Distefan, Jackson, White & Gilpin, 2002). Perceived pervasiveness of promotional messages also discriminated smokers from non-smokers (Unger et al., 2001).

To reduce the influence of tobacco marketing in some countries counter advertising campaigns have been launched (Sly, Hopkins, Trapido, & Ray, 2001). Reports on the effectiveness of these campaigns have been inconsistent, with some reporting successful outcomes, while others fail to find an association between the antismoking messages and smoking initiation and cessation rates in the targeted population (Unger et al., 2001). A recent cross-sectional study exploring the effects of pro- and anti-tobacco advertising in the same cohort found some evidence for a protective effect of anti-tobacco campaigns, but the effect was weaker and unable to counteract the pro-tobacco effects (Straub, Hills, Thompson & Moscicki, 2003). In a longitudinal study no protective effect was found for anti-tobacco advertising effects (Straub, Hills, Thompson, & Moscicki, 2002). A review of the antismoking campaign studies seems to lead to the conclusion that well-designed and sufficiently funded campaigns are successful in changing adolescents' attitudes towards cigarettes and deterring them from

smoking. But further research is needed to discover the right approach and messages that need to be included in these designs (Pechmann, 2001).

In Bulgaria, tobacco marketing and promotional campaigns have only recently been regulated and are still very actively present. On the other hand, antismoking campaigns are practically non-existent. For this reason the present study will include evaluation of the effects of perceived smoking ads pervasiveness and receptivity to marketing messages as one factor influencing smoking behavior.

Peer Influence

Adolescence is the developmental period when an older child becomes more independent and more separate from his/her family, as s/he approaches adulthood. Adolescents are presumed to accept fewer attitudes and values primarily from the family and gradually grow more influenced by their peers. This shift in values and attitude formation also leads to different factors that influence teenagers' behaviors. The pattern is true for smoking as well. Many studies have found that peer smoking is a very strong predictor of adolescents' smoking status (Alexander, Piazza, Mekos, Valente, 200; Flay, Phil, Hu, & Richardson, 1998; Lewinsohn, Brown, Seely, & Ramsey, 2000; Urberg et al., 1991; Wang et al., 1995). Although the relationship is often assumed to be causal it needs to be pointed out that three major transmission mechanisms can be identified: modeling, peer pressure and selective association (Urberg et al., 1991). In selective association models, friends are selected on the basis of similarity, which may very well include smoking status. This mechanism reveals the possibility for a two-way relationship between peers' smoking and adolescents' smoking status. Still the consistency of emergence of peer smoking as a reliable predictor for smoking initiation makes it an

important variable to explore in a new population. Reports of ethnic differences in the importance of peer influence exist (Griesler & Kandel, 1998; Unger et al., 2001), but overall the correlation is found across cultures (Kaplan, Springer, Stewart & Stable, 2001; Piko, 2001; Unger, Yan, Shakib, Rohr Brach, Chen, Qian et al., 2002). These facts provide additional support for the inclusion of peer influence as a factor in this study of a Bulgarian sample.

Family Influences

Parenting practices are another important factor associated with early smoking initiation especially in the earlier years of adolescence. While the effect of parent smoking appears to be smaller than the effect of peer smoking (Kaplan, Springer, Stewart. & Stable, 2001), there is evidence that aspects of parenting style can reduce the onset of smoking. The list of these factors includes parent-child discussion of smoking and clearly set rules for consequences of smoking (Chassin, Presson, Todd, Rose, & Sheran, 1998; Jackson & Henriksen, 1997), perceived disapproval of smoking (Elsenberg, & Forster, 2003), parenting style with high levels of intimacy and autonomy (O'Byrne, Haddock, & Poston, 2002) and home smoking restrictions (Proescholdbelt et al., 2000). The combination of these characteristics is sometimes referred to as authoritative parenting and has been considered to play a major role in successful socialization and to protect adolescents from substance abuse (Pierce et al., 2002). Conversely, parental smoking exposure (Jackson & Henriksen, 1997) increases the risk of smoking initiation. These reports suggest that family influences are also worth exploring when a new population is surveyed.

Demographic Variables

A number of additional factors are also included in almost any study trying to explore the predictors of smoking initiation and cessation. These include gender, age, socioeconomic status and level of education of the parents. Some of these variables are inconsistently associated with adolescent smoking initiation, probably because they are highly sample specific. All of these demographic characteristics will be included in the present study for better description and understanding of the sample.

The Transtheoretical model

Overview

Over the last 20 years of extensive research the Transtheoretical model of behavioral change (TTM) has proved to be one of the best frameworks for behavioral change (Redding, Rossi, J., Rossi, S., Velicer, & Prochaska, 1999). It emerged as an integration of the ideas in the leading theories of psychotherapy and behavioral research (Prochaska, Redding & Evers, 2002). Initially the model was developed for smoking cessation, but has rapidly expanded and has been applied across a wide variety of behaviors (dietary fat reduction, substance abuse prevention, condom use, mammogram screening, exercise, etc.) and diverse populations (Prochaska et al, 1994). Transtheoretical model-based interventions have been developed that are cost-effective and applicable to adolescent populations (Redding et al. 1999).

The TTM explains behavior change through the relationship among several core constructs: stages of change, processes of change, decisional balance and self-efficacy (situational confidence to resist/temptation to relapse). In this framework, behavior change is viewed as a process over time, which involves progress through series of stages

(precontemplation, contemplation, preparation, action and maintenance). The model is often described as involving three dimensions: the temporal dimension, the dependent variable dimension and the independent variable dimension (Velicer, Prochaska, Fava, Norman, & Redding, 1998). The most important organizing construct is the temporal dimension represented by the Stages of Change. The Processes of changes are viewed as a series of independent variables, while the Decisional Balance and Temptation scales are the outcome measures in the model (Velicer et al., 1998). The constructs of the model will be examined in greater detail below as well as its application to smoking and stress, adolescents and across cultures.

Stages of change

The stage of change is the key organizing construct of the model (Velicer et al., 1998). It reflects an individual's readiness to take action in desired direction and represents the temporal dimension of the model, according to which change is a process that goes through five stages:

Precontemplation: In this stage people are not planning to take any action in the near future (usually defined as the next six months). People are in this stage usually because they are demoralized, resistant and not well informed or due to a number of unsuccessful attempts to change. Traditional health promotional programs do not target and even exclude people with such characteristics.

Contemplation: Characteristic for this stage is the intention to change behavior in the next six months. People are aware of both the pros and cons of changing. Due to this balance between the benefits and barriers many people stay in this stage for long time and become "chronic contemplators (Velicer et al., 1998).

Preparation: In this stage people are ready to take action in the immediate future (the next month) and have already made some significant step towards changing in the last year.

Action: To be in the action stage people must have met some significant measurable criteria of change in their life-style in the past six months. In some models this change of behavior is equated with the change, but in the TTM this is only one of the five stages of the complex process of change. In this stage a serious danger of relapse to an earlier stage (i.e., slipping back into the undesired behavior) exists.

Maintenance: In this stage people have managed to keep the desired behavior change for a prolonged period of time (usually at least six months). The major goal for people in this stage is to prevent relapse, although the temptation to return to the unwanted behavior is largely reduced compared to those in the Action stage.

People who need to change their behavior are in one of the first three stages. It has been demonstrated that the distribution of adults across stages follows a consistent pattern for smokers in the United States. Approximately 40% are in Precontemplation, 40% in Contemplation and 20% in the Preparation stage (Velicer, Fava, Prochaska, Abrams, Emmons, & Pierce, 1995). The distribution in European samples is quite different (Etter, Perneger, & Ronchi, 1997) with 70% of smokers in Precontemplation and only 10% in Preparation. People in the early stages are expected to take less action than people in more advanced stages. This stage effect is considered one of the most important determinants of behavior change and has been demonstrated to be rather consistent and stable in intervention trials (Prochaska, Velicer, Prochaska & Johnson, 2004).

Decisional balance

Decisional balance is the construct that indicates the relative weight a person ascribes to pros or cons of changing, thus revealing attitudes towards the target behavior and providing an indicator of the committed decision to start the change (Plummer et al. 2001). The construct was derived from Janis and Mann's model of decision making (Janis & Mann, 1977). Although the initial model included four separate categories, an empirical test of the model with a sample of smokers revealed only two factors: the Pros and Cons (Velicer, DiClemente, Prochaska, & Brandenburg, 1985). This structure has replicated across a series of at least 12 behaviors (Prochaska et al. 1994) and was integrated in the model in this form.

A predictable pattern has been observed in the relationship between the Pros and Cons and the Stages of change across behaviors (Prochaska et al., 1994). In Precontemplation the Pros of the behavior far outweigh the Cons. In the later stages the opposite is true with the crossover occurring in either Contemplation or Preparation. This finding led to the formulation of the strong and weak principles of change (Prochaska, 1994). The strong principle stated that an increase of one standard deviation is expected in the Cons of the unhealthy behavior (or the Pros of the healthy behavior), while the weak principle stated that a decrease of a half standard deviation would be expected in the Pros of the unhealthy behavior (or the Cons of the healthy behavior).

Self-efficacy

Self-efficacy is a situation-specific construct, which provides information on the individual's potential to cope with any high-risk situation without relapsing to the unwanted behavior. The construct has been adapted from Bandura's self-efficacy theory (Bandura, 1977, 1982) as well as Shiffman's coping model of relapse and maintenance (Shiffman,

1986). This construct is represented by a Temptations measure (smoking) or a Confidence measure (stress). The Temptation measure assesses the urge to engage in certain behavior in specific situations, while the Confidence measure evaluates the perceived ability of the individual to resist and not engage in the problematic behavior. In fact the two measures typically have identical structures and the same set of items, but use different response formats (Velicer et al., 1998). The structure of the construct is characterized by three factors, reflecting the most common types of risky tempting situations: negative affect, habit strength (craving) and positive social situations. The measures are good predictors of relapse in later stages.

This construct also has demonstrated a predictable pattern in relation to stages. The Temptations scale is represented by a monotonically decreasing function across stages, while the Confidence measure by a monotonically increasing function across the stages.

Processes of change

The processes of change are the strategies and techniques that are used to help the person to successfully make the behavior change and maintain it (Prochaska, Redding & Evers, 2002). They represent the independent component of the model and are characterized as the overt and covert behaviors that people use to progress through stages. Ten processes have received consistent empirical support in research (Prochaska & DiClemente, 1983). The processes are divided into two higher-order groups: Experiential processes used mainly in the early stages of change and Behavioral processes, used at the later stages. As the present study will not include processes measures, the construct will not be presented in greater detail.

Applying the TTM to smoking cessation

Smoking cessation is the area in which the largest amount of empirical research and data involving the Transtheoretical model has been collected. A large number of reliable measures have been developed and the relationships between the constructs of the model have been verified in cross-sectional (Fava, Velicer, Prochaska, 1995; Prochaska, DiClemente, Norcross, 1992) and longitudinal studies (DiClemente et al., 1991; Prochaska, DiClemente, Velicer, Ginpil, & Norcross, 1985). In addition a number of interventions based on the TTM have been successfully developed (Pallonen, et al., 1998; Redding et al., 1999; Velicer & Prochaska, 1999; Velicer et al. 1993, 1998).

TTM measures for adolescents

Although the TTM was originally developed for adult populations and the largest amount of work is in the area of smoking cessation, the model has also been applied to adolescents (Anatchkova et al. 2002; Elder et al. 1990; Pallonen, 1998; Pallonen et al., 1990, 1998a, 1998b; Prokhorov et al., 2002; Redding et al., 1998; Stern et al., 1987; Kremeres, Mudde, & DeVries, 2001; Aveyard, Lancahsire, Almond & Cheng, 2002). The work with adolescent samples sets new challenges as both cessation and prevention tasks must be addressed at the same time. For this to be accomplished additional development of the TTM measures was conducted.

Stages of change algorithm for adolescents

For adolescent populations the staging algorithm needs to include the progress towards smoking acquisition for non-smokers in addition to the existing five stages of change for smoking cessation (Plummer et al., 2001). An integrated measure has been developed which included three additional stages for acquisition (aPc, aC and aP), which

are the mirror images of the first three stages for cessation (Pallonen et al., 1998). The algorithm first established smoking status and then smokers and non-smokers are asked different set of questions to determine their stage. Stage distributions for adolescents also differ from those demonstrated in adult populations. Among smokers slightly fewere adolescents (35%) in the PC stage have been found compared to adult smokers. The smoking initiation staging algorithm is unique for adolescents. According to existing results, approximately 90% of adolescents have been staged as Acquisition-Precontemplation (aPC), that is, not being at risk for smoking initiation (Plummer et al., 2001; Redding et al., 1998).

Decisional balance and temptation scales for adolescents

Decisional balance measures for adolescent smokers and nonsmokers have also been developed (Migneault, Velicer, Prochaska, & Stevenson, 1999; Pallonen, Prochaska et al.1998) and different structures have been explored. The psychometric properties for TTM decisional balance and temptations measures for smoking cessation and acquisition were assessed in a large sample of adolescents (Plummer et al., 2001). Of all the models tested for decisional balance, the three-factor model proposed by Pallonen, Velicer et al. (1998) was the best fitting among both smokers and non-smokers. This model consists of three stable first order factors: six items measuring the Cons, three items measuring Social Pros and six items measuring Coping pros. The Coping Pros scale demonstrated substantial differences across stages of acquisition, supporting its importance as a unique factor in smoking acquisition.

Two different models emerged for the temptation scales for smokers and non-smokers. For smokers a four-factor hierarchical model demonstrated the best fit. The four

factors were Negative Affect, Positive Social, Habits Strength and Weight Control. For nonsmokers a five-factor hierarchical model had the best fit. The first four factors were identical with the factors for smokers and the fifth additional factor was labeled Curiosity (Plummer et al., 2001). The highly correlated hierarchical models for the Temptation scale suggest that a single temptation score is best for use as an outcome measure, while the subscale scores are most useful when individualized interventions are developed (Velicer et al., 1990).

The TTM measures and scales described above will be used as a basis for the development of measures, tailored for this Bulgarian adolescent population.

Applying the TTM to stress

Unlike smoking cessation, stress management is not an area in which the TTM has been traditionally applied. Only in recent years has work been initiated for the generalization of the model to this problem behavior (Velicer et al., 1998). The process of application of the model takes several years and the different constructs are at different levels of development. As the temporal dimension is the key aspect of the model the Stages of change algorithm for stress management has been developed and tested across a number of samples (Robbins et al., 1998; Fava et al., 2000) and has proven robust across samples.

Situational confidence to manage stress represents the self-efficacy construct. This aspect of the model has also been developed and tested in adult samples with satisfactory results (Norman et al., 1997). Currently the work on adapting the measures for adolescent populations is continuing. Some data from pilot studies has been presented on processes of change and decisional balance (Fava et al., 2002, Mauriello et al., 2002)

and the same data were used for measurement development work on the Stages of Change algorithm. The latest version is currently in the field and will be translated and included in this study using a Bulgarian sample.

Developed specifically for smoking, Transtheoretical model-based interventions have demonstrated efficacy in helping people quit smoking across a variety of populations in the US and in different countries (Pallonen et al, 1994, 1998; Prochaska et al., 1993, 2001a, 2001b; Prokhorov et al, 1995) at a relatively low cost. This makes this paradigm promising for adaptation to Bulgarian high school students.

The project explored the patterns of smoking behavior among Bulgarian high-school adolescents providing initial information for factors, correlated with smoking initiation. Developing TTM measures for smoking and stress management in Bulgarian high school-aged adolescents will allow us to better understand the factors that influence smoking initiation and cessation and the dynamics of the process. Identifying the variables that influence the decision to smoke in high school is an important step towards the development of strategies to reduce these risks. This study provides a foundation for future intervention development using the Transtheoretical model.

Methodology and procedures

Research hypotheses

The present study has two major goals. The first goal is development and validation of the TTM measures for smoking cessation and acquisition for Bulgarian adolescents. The second is to explore the predictors of smoking behavior for the same population. Although the two goals are closely related, the research hypotheses will be listed separately to enhance clarity.

Measurement development and construct validity hypotheses:

On the basis of the literature review of other studies adapting the TTM measures to new populations, the following hypotheses and research questions have been formulated:

1. The basic structure of the scales for the major TTM constructs (decisional balance and temptations) will be replicated for the Bulgarian sample for smoking cessation and acquisition.
2. A different stage distribution is expected for the Bulgarian sample in smoking behavior with larger percentage of smokers being in the precontemplation stage of change and higher percentage of non-smokers expressing readiness for smoking initiation compared to the results found with US adolescent samples.
3. The pattern of decisional balance and temptation distribution across stages will follow the specific predictions made by the model and thus will confirm its internal validity and applicability to a Bulgarian sample.

Predictors of smoking behavior hypotheses:

Although a large number of studies have researched the factors that influence smoking initiation in adolescents, almost no information is available for the problem in Bulgaria. Thus this part of the study will be exploratory in nature and the formulated hypotheses are secondary in nature, as they are formulated on the basis of research performed with different populations.

4. It is expected that level of perceived stress will be higher for the smokers than for nonsmokers.
5. Stress management skills may act as modifiers of the stress-smoking relationship. For those with high levels of perceived stress and high levels of coping skills,

smoking will be less likely than for those with similar levels of perceived stress, but low coping skills levels.

6. Other factors, such as family influences, attitudes and beliefs, peer influences and smoking related marketing will also influence the degree of involvement with smoking and serve as modifiers to the stress-smoking relationship. Family anti-smoking environment, lower perceived prevalence of tobacco related marketing and a lower number of friends who smoke will result in a lower likelihood for smoking initiation and higher readiness to quit even when perceived levels of stress are high.

Procedure

The fieldwork for the project started with a review of Bulgarian scientific journals and personal contacts with the organizations dealing with smoking prevention and cessation work on site. During this phase official approval for the study was obtained from the responsible authorities (see Appendix B) and contacts with principals of schools approached for participation were established.

All items were translated from English into Bulgarian and back translation was performed to check the accuracy of the underlying constructs. Since the TTM had not yet been applied to a Bulgarian sample, a more culturally sensitive approach to the development of measures for this Bulgarian sample was required. For this reason content review and cultural tailoring was performed on the translated TTM scales and some new items were added to ensure an adequate pool of items. After the translated culturally tailored scales were printed and copied, they were distributed to the schools in which permission for the study was obtained. Schools were selected to represent the major school types in the country with general, technical and humanities profile. All students were asked to read a consent/assent

form prior to filling out the survey (Appendix C and D). This form described the study procedure and outlined the participation agreement. Contact information was provided for students who wanted more information. The students were asked to read and keep the form. A waiver of signed consent assured the complete confidentiality of participants. The completion of the survey indicated that they understood the study and agreed to participate. The form also provided information about the purposes of the study. The anonymity and confidentiality of participation was guaranteed. An envelope in which the completed form was sealed and returned was provided with each questionnaire so that participants' anonymity and confidentiality remained protected. No personal identifying information was requested. All students were eligible to participate. All participants received a small incentive (a set of pens and a small organizer) for their participation after completing the survey. The Institutional Review Board at the University of Rhode Island reviewed and approved all procedures and forms used in this study for the protection of participants.

Participants

Participants were recruited from the last grades of high school (16-18 years old) in the two biggest cities in Bulgaria (Sofia and Plovdiv). The study procedures produced a sample of 673 students in the last grades of high school (15-19 years old) recruited from 12 high schools. In an open-ended question on ethnicity the vast majority (96.8%) of the students self identified as Bulgarians. The remainder pointed out various religious and national identities. The sample was 64% female, equally distributed across the included age range, 47.8% reported a GPA equivalent to A and 42.8% were ever smokers. Descriptive statistics and demographic variables for the total sample and for smokers and nonsmokers are presented in Table 1.1.

Measures

The battery consisted of a number of measures translated for the first time in Bulgarian and used with a Bulgarian sample. The majority of the measures were TTM constructs. In addition some stress and family influence measures, as well as items related to tobacco related marketing and peer influence were included to answer some specific research questions. All participants were presented with the full battery of instruments. The first part, including the demographics and the stress questions, was the same for all participants. After that, there were two different sets of items for smokers and for nonsmokers respectively in the second part. Participants were guided through one skip pattern to the correct set of questions relevant to their smoking status (See Appendix A).

The following measures (in Bulgarian) were used (see Appendix E for the English version of the battery and Appendix F for the Bulgarian):

Demographic section: This section consisted of a set of questions assessing age, gender, ethnicity, grade level, type of school, level of parents education and future plans for all students. It also included the date of completion of the survey.

Perceived Stress Scale: The perceived stress scale is a 14-item scale designed to measure the degree to which situations in one's life are appraised as stressful. The internal consistency of the original scale is .85. The scale has been shown to correlate with smoking reduction maintenance and predict the number of smoked cigarettes (Cohen, Kamarck, Mermelstein, 1983).

Rhode Island Stress and Coping Inventory (RISCI): The Rhode Island Stress and Coping inventory is a 10-item scale assessing physical symptoms and ways of coping with stress (Fava, Ruggiero & Grimley, 1998).

Family influences: The amount of family support for nonsmoking is assessed by this 4-item scale (Redding, Rossi et al., 1998, 1999).

Stages of stress management for adolescents: This algorithm asks about the consistency and efficacy of stress management and the time devoted to active stress management per day (Mauriello et al., 2002).

Media Exposure to smoking messages and opinions about smoking: A set of independent questions assessing participants' exposure to media images related to smoking (ads and anti-smoking messages) and some attitudes towards smoking are included in the list (questions are adapted from the WHO/CDC GYTS).

Smoking status definition question: A group of questions, defining the smoking status of participants. Subjects are divided in ever smokers and never smokers. The rest of the measures are administered according to the smoking behavior defined by this measure.

Depending on his or her smoking status each participant received a battery of TTM measures. The smokers received the scales assessing their readiness to quit smoking, while non-smokers filled out measures related to their risk for initiating smoking. The scales, representing the same constructs in the model, are described together.

Stages of change algorithms for adolescents: The 6 item scale for smoking cessation assessed individual's stage of readiness to quit smoking (Pallonen et al., 1998; Plummer et al., 2001). This new staging scale for smoking acquisition (6 items) measured participants determination to stay smoke-free and hence their risk of becoming a smoker (Anatchkova et al., 2002).

Temptation scales for adolescents: The two scales measured the strength of temptation of different situations that can lead to smoking initiation or relapse to smoking

after a quit attempt (Plummer et al., 2001). As with the decisional balance scales new item pools were created for the Bulgarian sample and the resulting measures were compared with the English language measures. Plummer et al. (2001) reported on a four factor hierarchical structure for the temptation scale for smokers. The model included three factors traditionally found in the Temptation measures, namely Habit Strength, Positive Social and Negative Affect and an additional fourth factor – Weight Control. All factors demonstrated good Cronbach's alphas, ranging form .72 to .81 and good loadings on the temptation factor. For nonsmokers the authors reported a five factor hierarchical model including the four factors for smokers plus a factor labeled Curiosity. The Alpha coefficients ranged from .66 to .85. The fact that reported subscales have only two items might be reason for concern and cause some difficulties replicating these findings.

Decisional balance scales for adolescents: The two decisional balance scales contain equal numbers of pros and cons either of smoking (Plummer et al., 2001) or of being smoke-free (Anatchkova et al., 2001). The scales measure the importance of each statement in the decision to quit smoking among smokers or the decision to stay away from cigarettes among nonsmokers. The existing English language scales have demonstrated three-factor models with good psychometric properties. The Coefficient Alphas were .79 for the Social Pros Scale, .87 for the Coping Pros scale and .88 for the Cons scale for smokers. The corresponding coefficients for nonsmokers were respectively .68, .79 and .86 (Plummer et al., 2001). In the present study additional items were included in the initial pool.

Analyses

Measurement development procedures

One of the goals of the current study was measurement development of the constructs of the TTM (decisional balance and temptation for smoking cessation and acquisitions) for the Bulgarian population. The expectation was that the measures for the Bulgarian sample would replicate the existing and theoretically predicted structure of the respective measures. The steps in these analyses are generally outlined below with some specific remarks on each construct.

The translated items from the existing measures along with a number of new items written for the Bulgarian sample comprised the initial item pool. The new items were presented for review to experts in the field in order to establish their face validity.

After the pool of items was administered, a preliminary analysis of the items was performed to detect any problematic items. Descriptive statistics including the mean, standard deviation, skewness and kurtosis were examined for extreme scores and items with out of range values were excluded from further analysis.

As the measures are different for smokers and nonsmokers the general sample was split according to smoking status. This split produced a group of 276 smokers and a group of 349 nonsmokers. Both groups had sample sizes that allowed for a split-half cross-validation approach in which exploratory and confirmatory analyses were conducted on two separate subsamples. The exploratory analysis was performed using principal components analysis (PCA) techniques. This step determined the underlying latent dimensions of the construct. In addition the factor loadings of the items determined the final item set that best describes those dimensions. Items with low factor loadings (less than .50) and with complex loadings were

deleted. Thus only the items with the best factor loadings and good content breath were retained. In order to evaluate the internal consistency of the scale, Cronbach's Alpha was calculated. At the next step confirmatory analysis was performed on the second half of the sample. This procedure tests the fit of the model developed at the previous stage and confirms and finalizes the psychometric structure of the measure in the Bulgarian sample. For this step, structural equation modeling (SEM) techniques were used. The use of SEM in scale development as a step in the confirmation of a scale structure has become a widespread practice in recent years. The technique enhances the confidence in the structure and psychometric properties of the scales.

In every SEM model parameter estimates are generated, following specific rules, and through an iterative procedure a model reproduced matrix is generated, which is expected to come as close as possible to a sample matrix (Raykov & Marcoulides, 2000). Through examination of the closeness between these matrices the quality of the model is evaluated (Tabachnik & Fidell, 2001). The chi-square is the general inferential test used to determine the fit of the model. A good fitting model is one that fails to reject the null hypothesis (a chi-square with large p values). Although Chi-square value needs to be examined in the evaluation of the model fit it also has some serious limitations. The test is strongly influenced by the sample size and is very sensitive to violations of assumptions (Bentler, 1990). For this reason, a number of different fit indexes have been proposed and are commonly used and routinely reported in SEM results, along with the chi-square value. In the present analysis the following fit indexes will be examined and reported. The Comparative Fit Index (CFI) proposed by Bentler (1990) uses a different approach to model fit evaluation and uses the non-central chi-square distribution. Values greater than .90 are considered to indicate good

model fit and the index gives accurate estimates for smaller sample sizes. When the model fit is evaluated it is also important to consider the extent to which the model fails to fit the data. One index, which accomplishes that task and has gained popularity in recent years, is the Root Mean Square Error of Approximation (RMSEA) (Steiger & Lind, 1980). This index provides an estimate of the lack of fit in the model compared to a saturated model. Values below .05 are considered to provide an indication for a good model, while values larger than .10 indicate a poor fitting model (Raykov & Marcoulides, 2000). The Root Mean Square (RMS) residual will also be evaluated. This index represents the difference between the sample variances. A good-fitting model is characterized by small RMS value (<.05). The root mean square error of approximation (RMSEA) provides estimate of the lack of fit in the model compared to a saturated model. Values larger than .10 indicate a poor fitting model, while values below .06 are considered indicative of a good fit. The residuals in the model also provide valuable information for the fit of the model. The Average Absolute Standardized Residuals (AASR) in the model will be examined for some indicators of misfit in the data.

Finally, invariance testing was performed for all measures across the exploratory and confirmatory subsamples and across gender-based subsamples.

External Validation of the TTM measures

The Transtheoretical model makes specific predictions for the relationship between the constructs of decisional balance and temptations of smoking and stages of change. The standardized decisional balance scale is expected to produce a crossover pattern of the two factors (the pros and the cons), with the cons being higher than the pros at precontemplation, while the opposite should be true in the later stages (action and maintenance). The crossover

is expected to occur in contemplation or preparation. The temptation scale is expected to maintain its structure (hierarchical structure with one single higher-order factor) with gradually decreasing scores across stages for smoking cessation and stages for commitment to stay smoke free.

In order to validate the new scales these patterns were examined. For this purpose the raw score for the factors were computed as the sum of items. Then the raw scores were standardized by conversion into T-scores (M=50, SD =10). Analysis of variance was conducted to determine whether significant mean differences in the scores exist across stages. Follow up Tukey tests revealed the exact stages between which differences existed.

The correlation of the developed scales with gender, school, and age were also be examined in order to test the construct validity of the scales.

Analysis on Predictors of smoking behavior

Another goal of the study was to explore and describe the relationship between a range of psychosocial factors and the smoking status of adolescents in Bulgaria. For this purpose a series of logistic regression models and discriminant function analyses were conducted. The same techniques were also used to explore predictors for stage membership. The general strategy used in these analyses is outlined below and more details are provided in the respective chapters.

Logistic regression was used to describe the relationship between a dichotomous variable and one or more explanatory variables. As with any other model-building technique the goal was to find the best-fitting and most parsimonious and yet plausible model accounting for the relationships between the outcome and the predictors (Hosmer & Lemeshow, 2000).

Several outcome variables were explored in different parts of the study: smoking status, defined in two different ways, and preaction vs. postaction grouping of the stages for both smokers and nonsmokers. For smokers the outcome measure will be based on the stage distribution. The first three stages (precontemplation, contemplation and preparation) were collapsed into "current smoker" and the last two (action and maintenance) into "ex-smoker". The influence of the same set of factors was explored. The outcome measure for non-smokers was formed in a similar way from the stage distribution, this time collapsing across stages and splitting the group into "at risk for smoking" and "committed non-smokers" subgroups. Variables were selected for inclusion in the model based on univariate test results. Explanatory variables along with interaction terms were forced sequentially in the model to test the predictions outlined in the hypotheses. After a satisfactory model was fitted, the significance of the included variables was evaluated using a likelihood ratio test and a Wald statistic. Non-significant variables were eliminated from the final model. At the final step, the goodness of fit of the estimated model was evaluated using the Hosmer-Lemeshow test. The goodness of fit provides information on the effectiveness of the model in describing the outcome variable.

As an alternative approach the same outcome variables were explored through discriminant function analyses. Traditionally the method was used to answer the question: how accurately can group membership be predicted from a linear combination of variables? In the current study, the method was also used to interpret the emerging constructs and linear functions. The analysis followed similar steps to the ones described for the logistic regression. The same univariate test results were used to narrow down the number of variables included in the initial model. Data was examined for outliers and the assumptions

of normality, linearity and equality of variance-covariance matrices were examined. The initial model was examined and revised several times based on the correct classification rate and the importance of included predictors assessed both through their standardized coefficients and their loadings. Both the linear combination and the classification rates of the final DFA models were compared to the results of the logistic regression analyses.

The presentation of this dissertation is organized into separate chapters. The measurement development work for the Decisional Balance and Self-efficacy for smokers is presented in Chapter 2 and for nonsmokers in Chapter 3. In addition Chapter 4 presents the results of the validation of the stress scales used in the study. The results for the analyses predicting smoking status are presented in Chapter 5, the logistic and DFA models for smokers are presented in Chapter 6 and the logistic and DFA analyses for nonsmokers are in Chapter 7. Finally the general conclusions, limitations and direction for future work are presented in Chapter 8.

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Table 1.1. Demographic characteristics

	Total sample			Smokers			Nonsmokers		
	N	***Mean***	***SD***	***N***	***Mean***	***SD***	***N***	***Mean***	***SD***
Age	671	16.52	1.12	276	16.70	1.05	368	16.45	1.16
GPA	668	5.31	.769	276	5.08	.825	365	5.49	.689
Average pocket money per day (leva)	639	3.23	2.14	273	3.46	2.19	344	3.07	2.14
# of cigarettes in the last 24 hours	*NA*	*NA*	*NA*	261	10.24	9.5	*NA*	*NA*	*NA*
	N	***%***		***N***	***%***		***N***	***%***	
Gender									
Female	435	64.6		191	69.5		228	61.8	
Ethnicity									
Bulgarian	603	96.8		247	96.1		335	97.1	
Other	20	3.2		10	3.9		10	2.9	
Plans for the future									
Apply to college	409	61.3		168	61.3		223	60.9	
Start working	38	5.7		19	6.9		19	5.1	
Apply to college abroad	139	20.8		50	18.2		85	23.2	
Join the army	11	10.5		3	12.4		6	1.6	
No idea	70	10.5		34	12.4		33	9.0	

Chapter 2: Development and validation of Measures for Decisional Balance and Self-efficacy for Bulgarian adolescent smokers

Introduction

The Transtheoretical model of behavioral change has become one of the most influential models in the area of health behavior prevention and intervention (Redding et al., 1999). The model was proposed twenty years ago by Prochaska and DiClemente (1983) and has been extensively tested and developed in the last twenty years. The model emerged as an integration of the ideas in the leading theories of psychotherapy and behavioral research (Prochaska, Redding & Evers, 1997). Initially the model was applied to smoking cessation and a great body of literature was devoted to the application of the model to this area. Gradually new health behaviors were also successfully studied through the model (fat reduction, condom use, alcohol, exercise etc.) (Prochaska et al, 1994).

The TTM includes several core constructs in the explanation of behavior change. These include: stages of change, processes of change, decisional balance and self-efficacy (situational confidence to resist/temptation to relapse). The model is often also described as involving three dimensions: temporal, dependent variable and independent variable dimension (Velicer et al., 1998). The Stages of Change represent the temporal dimension, which is a key organizing construct, the Process of change are the independent dimension and the Decisional balance and the Self-efficacy are the outcome measures of the model.

The stages reflect an individual's readiness to take action in a desired direction. According to the model change is a process that goes through five stages: precontemplation, contemplation, preparation, action and maintenance.

Decisional balance is the construct that indicates the relative weight a person ascribes to pros or cons of changing, thus revealing attitudes towards the target behavior and providing an indicator of the committed decision to start the change (Plummer, Velicer, Redding, Prochaska, Rossi, & Pallonen, 2001). The model postulates two factors: the Pros and the Cons (Velicer, DiClemente, Prochaska, & Brandenburg, 1985), but research with adolescent smokers has revealed a three factor structure, Social Pros, Coping Pros and Cons (Plummer, et al. 2001).

The self-efficacy construct is represented by the Temptation measure for smokers, which assesses the strength of temptation to smoke across specific situations. Traditionally the construct has been described as having three distinct factors: positive social situations, negative affect and habit strength (Velicer et al., 1998). The Plummer et al. (2001) study found an additional fourth factor, weight control, for adolescent smokers.

As the model has been developed by US scientists most of the work has been performed on US populations providing a lot of evidence for its validity in this context. A growing body of evidence has also supported the validity of some of its key constructs applied to smoking behavior in other western cultures, e.g. German, Swiss and Dutch populations in the works of Keller, Nigg, Jaekle, Baum & Basler (1999), Etter & Perneger (1999) and Dijkstra, de Vries & Bakker (1996). The model has also demonstrated validity for Finnish men (Pallonen et al. 1994) and Japanese adolescents (Yang, Chen, Zhang, Samet, Taylor & Becker, 2001). However the majority of these studies were conducted in countries with a strong emphasis on smoking prevention programs and stable economic climates. Research in the context of developing countries is very rare and no study to date has tried to explore the validity of the TTM constructs in

the countries of Eastern Europe. Filling this gap will be an important initial step for the development of future prevention and intervention programs and in addition will constitute a test of the cross-cultural validity of key TTM constructs.

The goal of the current project is to develop measures for two of the three key TTM constructs (decisional balance and self-efficacy) and examine their validity for Bulgarian adolescent smokers. It was expected that the basic structure of the scales and the theoretical predictions about relationships of the constructs with stages of change would be replicated for the Bulgarian adolescents sample. Due to the lower levels of antismoking activity in Bulgaria it was also hypothesized that the stage distribution will be different than the one observed in US samples with larger percentage of participants expected to be in the Precontemplation stage of change and not ready to quit smoking.

Methods

Procedure

The sample for this project consisted of students in the last grades of high school (15-19 years old) recruited in 12 randomly selected high schools of the two largest cities in Bulgaria (Sofia and Plovdiv). The University of Rhode Island Institutional Review Board approval for all data collection protocols was attained prior to the start of recruitment. The schools were selected to represent the major school types in the country (with general, technical and humanitarian profile). The principals of 14 schools were approached with a request for participation. Two of the schools declined due to the approaching end of the semester and in one of the schools the students had recently participated in a different study exploring risky behaviors. After permission was obtained from the principal of a school further arrangements were made with a teacher for the exact time of the data collection. The

investigator administered the survey materials. All participants were presented an assent or consent form prior to their participation and were offered a small incentive for their time (a set of notebook and pens). The survey materials were distributed along with a white envelope in which participants sealed and returned their anonymous answers. None of the students declined participation and only 5 empty cards were returned.

Measures

The full battery consisted of a number of measures translated for the first time in Bulgarian and used with a Bulgarian sample. The majority of the measures were TTM constructs. In addition some stress and family influence measures, as well as items related to tobacco related marketing and peer influence were included to answer some specific research questions. All participants were presented with the full battery of instruments. The first part, including the demographics and the stress questions, was the same for all participants. After that, depending on their smoking status participants were guided through one skip pattern to one of two different sets of items for smokers or for nonsmokers. Only the measures relevant for smokers will be presented here.

Smoking status definition questions: Two questions were used to determine the smoking status of participants. The first divided subjects in ever smokers and never smokers. The second differentiated between never smokers, regular smokers, experimental smokers and quitters. Depending on his or her smoking status each participant received a battery of TTM measures. The regular smokers and the quitters were collapsed into the group of smokers and received the following scales.

Stages of change algorithm for adolescent smokers: This is a 6 item scale for smoking cessation assessing individual's stage of readiness to quit smoking (Pallonen et al., 1998; Plummer et al., 2001).

Decisional balance scale for adolescent smokers (23 items): The original decisional balance scale (Plummer et al., 2001) contains pros and cons of smoking and measure the importance of each statement in the decision to quit smoking. The existing English language scales have demonstrated a three-factor model with good psychometric properties (Plummer et al., 2001). In the present study eleven additional items (a total of 23 items) were included in the initial pool and the measurement development results are compared to the psychometric properties of the original scale.

Temptation scales for adolescents (17 items): This scale measures the strength of temptation to smoke in different situations (Plummer et al., 2001). A four factor hierarchical structure with good psychometric properties has been reported for this measure (Plummer et al., 2001). The model included three factors traditionally found in the Temptation measures, namely Habit Strength, Positive Social and Negative Affect and an additional fourth factor – Weight Control. All factors demonstrated good Cronbach's alphas, ranging form .72 to .81 and good loadings on the temptation factor. As with the decisional balance scale a new item pool was created by adding 9 new items for the Bulgarian sample and the resulting measures are compared with the English language measures.

Analytic Plan

Only the smokers were included for the measurement development and validation of the smoking cessation measures. First, this sample was split in half. One half of the sample

was used for exploratory item analysis, PCA and exploratory model testing. The second half was used for confirmatory analysis using SEM. After satisfactory models were developed, each measure was tested for invariance across the two halves of the sample and in a separate analysis across gender. Finally, the relationship between the measures and the stages of change was examined.

Results

Participants

The study procedures produced a sample of 673 students in the last grades of high school (15-19 years old) recruited from 12 high schools. In an open-ended question on ethnicity the vast majority (96.8%) of the students identified themselves as Bulgarians. The remainder pointed out various religious and national identities. The sample was 64% female, equally distributed across the included age range, 47.8% reported a GPA equivalent to A and 41.0% were ever smokers. Of the total sample, 276 students (69.5% female, mean age 16.7) identified themselves as smokers or ex-smokers and were included in the analyses presented here (Table 1.1).

Decisional Balance Measure for smokers

For the Decisional Balance scale two items were initially excluded due to extreme mean values and nonnormal distribution of responses. A Principal Components Analysis (PCA) with Varimax rotation was performed on the remaining 21 items to test a three-factor solution, as described by Plummer et al. (2001). As expected a three-factor solution fit the data the best with the following subscales: Cons, Social Pros and Coping Pros. In the initial Principal Components solution, five additional problem items with low or complex loadings were selected for deletion. The MAP procedure also supported the

presence of 3 factors. The final principal components solution consisted of three factors and is presented in Table 2.1: Cons (6 items), Coping Pros (3 items) and Social Pros (5 items). The Cronbach's internal consistency coefficients for the Social Pros were $\alpha = .79$, the Coping Pros, $\alpha = .82$, and the Cons, $\alpha = .85$.

In order to find the best fitting model for the measure, three nested models were explored using structural equation modeling and EQS software. The procedure tested consecutively: an uncorrelated model; a model with only the two pros scales correlated; and a fully correlated three-factor model. An hierarchical model (reparameterization of a fully correlated model) with a latent variable for General Pros, with two subscales (Social Pros and Coping Pros) was also examined. Since there were only two scales associated with the latent variable, their loadings were constrained to be equal in the estimation process. The chi-squares and the degrees of freedom for the models are presented in Table 2.2. The fully correlated and the hierarchical model demonstrated the best fit to the data with acceptable values χ^2 (74) = 137.4, CFI = .90; RMSEA=.08. The chi-square difference tests showed significant differences between the uncorrelated and the correlated models, suggesting improvement in the fit of the correlated models compared to the others. Of the fully correlated and the hierarchical model, the hierarchical model was preferred due to the closer fit to the traditional theoretical construct (Figure 2.1).

A confirmatory factor analysis using structural equation modeling was performed on the second half of the sample. All models from the exploratory analysis were examined. The results confirmed that the hierarchical model was the best and it was the one retained $\chi 2$ (74) = 102.5, CFI = .95; RMSEA=.06 (See Table 2. 2). Even though the factor loadings for the two factors of the latent Pros scale were constrained to be equal, in

the standardized solution some minor discrepancy exists between the loadings, due to the computational method that the EQS software applies. The internal consistency for the 8-item combined Pros scale was $\alpha = .78$.

Temptations measure for smokers

The analysis for this scale followed the same steps. At the level of item analysis no items were excluded. The eigenvalues in the PCA suggested a three-factor solution for the scale, corresponding to the traditional structure of the scale. The MAP procedure indicated a 2-factor solution. As previous work has reported a four-factor solution for an adolescent population, this solution was also tested. Both three and four factor solutions were possible, but four components were retained following previous findings with populations of that age and theory. At the PCA step, four items were excluded due to poor or complex loadings. The final 4 components solution is presented in Table 2.3. The scale demonstrated good psychometric properties with the following Cronbach's coefficient alphas: Negative affect $\alpha = .87$, Positive Social $\alpha = .76$, Weight Control $\alpha = .86$ and Habit strength $\alpha = .78$.

At the next step the structure of the scale was explored through structural equation modeling. Four different models were tested: a three-factor hierarchical model, a four-factor independent model, a four-factor correlated model and a four-factor hierarchical model. In the course of this work one additional item was dropped from the Negative Affect scale due to poor loading and content. As previously described (Plummer et al., 2001) the four factor hierarchical model demonstrated the best fit (χ^2 (50) = 87.03, CFI = .95; RMSEA= .08). The same models were tested in the confirmatory sample and once again the four factor hierarchical model had the best fit to the data with satisfactory

results (χ^2 (50) = 109.03, CFI = .89; RMSEA=.10). A summary of these results is presented in Table 2.4. and the final models are presented in Figures 2.3 and 2.4.

Invariance testing

Two series of multigroup confirmatory factor analyses were conducted to test for the measurement invariance of the samples across the two randomly split subsamples of smokers and across subsamples of each gender using EQS. While theoretically any set of parameters can be tested for invariance (Bentler, 1995) there are specific invariance hypotheses that are described in the literature (Byrne, 1994; Bentler, 1995, Little, 1997) and test certain parameters together. Different sequences have been proposed for these tests (Cheung & Rensvold, 2002), but in this project the testing started with the least restrictive model and consecutively additional restrictions were imposed. The sequence of tests was the following:

Model A (congeneric): This is the congeneric model, which tests for the configural invariance of the measure. The pattern of loadings in all samples is identical, but the factor loadings, factors variance and error variance are allowed to vary.

Model B (lambda equivalent) This model builds on the previous one, but the factor loadings were constrained to be equal in both groups. The model tests for the item level metric invariance.

Model C (tau equivalent): Additional restrictions for equal factor variances and covariances are imposed in this model.

Model D (parallel): This is the most restrictive model, requiring all model parameters to be restricted to be equal across groups.

The procedure for selecting the best fitting model is identical to the one used to compare nested models for additional parameters: a series of models are estimated and the fit indices of a particular model are compared with one having additional constraints. The test traditionally used to compare the models is the chi-square difference test. This test is dependent on the sample size and can detect trivial differences in the models. As a remedy for this bias, Cheung and Rensvold (2002) suggest the use of a ΔCFI test (the difference between the CFI indexes of the compared models) with a proposed cutoff point of -.01 based on simulation studies. If the absolute value of ΔCFI is equal or smaller than the cutoff, the null hypothesis of invariance cannot be rejected. Both indices were used in the analysis. A summary of the results for the invariance tests is presented in Table 2.5. The results suggested that for the invariance across the two halves of the sample, the Parallel model can be retained for decisional balance and the Lambda-equivalent model for Temptations. Both the chi-square equivalence test and the ΔCFI supported that decision. Since the two samples were derived from a random selection from the same population it is more likely that the failure of the Temptations scale to reach the highest level of invariance was due to sampling error rather than to actual differences in the population. In addition, parallel invariance is a very stringent test, rarely achieved with real life data.

When the measures were compared across gender subsamples, the Lambda Invariant model was preferred for decisional balance and the Tau-equivalent model for Temptations. A summary of the results for these tests is presented in Table 2.5.

Stage distribution

The stage distribution for smokers was examined next. Of all participants classified as smokers 5 (1.8%) had enough missing stage item-level data that stage could not be determined. Of the remaining 271 participants 129 (47.6%) were in Precontemplation, 82 (30.3%) were in Contemplation, 3 (1.1%) were in Preparation, 30 (11.1%) were in Action and 27 (10.0%) were in Maintenance. Among current smokers (Pre-Action stages only, N = 214), the distribution was: 60.3% in Precontemplation (PC); 38.3% in Contemplation (C); and 1.4% Preparation (PR). Due to the very small number of participants in Preparation they were collapsed with the Contemplation stage group for all further analyses.

External Validation

The Transtheoretical model makes specific predictions for the relationship between the constructs of decisional balance and temptations and stages of change for smoking cessation. The standardized decisional balance scale is expected to produce a crossover pattern of the two scales (the pros and the cons), with the cons being higher than the pros at precontemplation, while the opposite should be true in the latter stages (action and maintenance). The crossover is expected to occur in contemplation or preparation (Prochaska et al., 1994). The temptation scale is expected to have gradually decreasing scores across stages for smoking cessation (Velicer et al., 1990; Plummer et al., 2001).

In order to externally validate the new scales the relationship between the stages of readiness to quit and the individual scales was examined. For this purpose the raw scale score was computed as the sum of items comprising the scale. Since the number of participants

classified in the Preparation stage was very low it was merged with the participants in the Contemplation stage in a combined C/PR group.

Relationship between the Decisional Balance scales and stages of change

Multivariate analysis of variance (MANOVA) on the decisional balance scales revealed significant multivariate effect for stage (Wilks' $\Lambda = .910$, $p < .05$). Analysis of variance conducted on the T scores (M=50, sd =10) revealed significant mean differences in the scores across stages of change for Cons of smoking $F(3, 261) = 4.14$, $p < .05$, $\eta^2 = .05$. Tukey post-hoc tests indicated that the Cons of smoking were significantly lower for participants in the PC stage of change compared to participants in the combined C/PR group. An ANOVA also found the Coping Pros of smoking were significantly different $F(3, 261) = 4.35$, $p < .05$, $\eta^2 = .05$. The post-hoc tests showed that people in the PC stage valued coping pros significantly more than people in the Action and Maintenance stage groups. No significant differences between stage groups were found for the Social Pros $F(3, 259) = .537$, $p > .05$, $\eta^2 = .01$. The combined Pros scale was also examined for differences across stages, but no significant differences were revealed $F(3, 254) = .627$, $p > .05$, $\eta^2 = .01$. The magnitude of the effects demonstrated by all the scales was smaller than the effects reported by Plummer et al. (2001), even though the pattern was similar: the Social Pros had the weakest effect, while the effect sizes of the Coping Pros and Cons were of equal magnitude.

The standardized pattern of the scales across stages is presented in Figure 2.5. The means and standard deviations of the scales are presented in Table 2.6.

Relationship between the Temptations scales and stages of change

A one way ANOVA showed that the combined Temptations to smoke scale varied significantly across stages $F(3, 248) = 15.25$, $p < .001$, $\eta^2 = .16$. The post-hoc Tukey tests

indicated that adolescents in the first two stage groups (PC, C/PR) were more highly tempted to smoke than participants in Action and Maintenance stage groups.

The individual Temptation subscales were also examined. MANOVA was performed to determine the variability of the subscales in the Temptation measure across stages. The results indicated significant multivariate effect for stage at the .01 level with a Wilks' Λ = .762, $p < .01$. Individual follow up ANOVAs were performed for each subscale. The Positive Social scale results were significantly different across stages of change $F(3, 253) = 11.78$, $p < .001$, $\eta^2 = .13$. The post-hoc tests showed that participants in PC and C/PR had higher scores than people in Action and Maintenance. These results also showed that adolescents in the PC group had higher scores than people in the Action stage.

The Habit Strength scale also varied significantly across stages $F(3, 254) = 8.09$, $p < .001$, $\eta^2 = .09$. The same pattern of relationship as for the Positive Social scales was discovered through the post hoc tests.

The next scale that demonstrated significant differences across the stages of change was Negative Affect, $F(3, 253) = 21.13$, $p < .001$, $\eta^2 = .20$. The post-hoc tests revealed a pattern identical to the combined Temptations scale.

The Weight Control scale also reached significance $F(3, 253) = 2.96$, $p < .05$, $\eta^2 = .03$, but the results were marginal and the post hoc tests did not indicate any significant patterns.

Once again the effect sizes for all scales were substantially lower for all scales than the ones reported by Plummer et al. (2001), but in both studies the Negative Affect subscale had the largest effect size and the Weight Control subscale had the weakest effect.

The standardized pattern of the Temptation scales across stages is presented in Figure 2.6 and the means and standard deviations of the scales are presented in Table 2.5.

The correlation of the developed scales with gender, school, and age were also examined in order to test the construct validity of the scales. As expected chi-square tests revealed no significant differences in the utilization of any of the constructs due to school or gender. Correlations between age and coping pros and cons were not significant. A modest negative correlation of -.290 between age and social pros reached significance.

Discussion

This study replicated the basic psychometric structures of the decisional balance and the self-efficacy measures for Bulgarian adolescent smokers. All the measures had good internal consistencies and demonstrated both the expected relationship with the stages of change and small relationships to demographic variables. These data support the construct and known-groups validity of these measures in this sample. These results indicate that these TTM constructs successfully passed an important test for cross-cultural validity and can be used as a basis for development of interventions for the population under study.

Measurement models

The measurement model for the Decisional Balance measure provided evidence for two distinct Pros factors: Social Pros and Coping Pros. While these results replicate previous findings with adolescent populations (Plummer, et al., 2001; Pallonen et al., 1998) they are not consistent with the two factor structure (Pros and Cons) established for the construct in studies using other populations and exploring different health behaviors (Prochaska, 1994). Since the distinction between Social and Coping Pros reemerged with Bulgarian adolescents, this issue is clearly important enough that it should be considered when intervention

programs for this population are developed. At the same time from a theoretical perspective is seems more accurate to describe the Social and Coping Pros as two facets of the more general construct of the Pros (the benefits of smoking). For this reason in the current study a two-factor hierarchical structure was presented and used, instead of the three factors structure presented by Plummer et al. (2001).

The Temptations to smoke measurement model generally replicated the model reported by Plummer et al. (2001). The same four factors were extracted: Positive Social, Negative Affect, Habit strength and Weight Control. The measure reported here differs mainly in the number of items included in each factor and the distribution of items across factors. The previous measure included only two items per factors, which is beneficial from the viewpoint of subjects' workload, but makes the factors less stable from a psychometric perspective. In the scale developed here, three of the factors contain three or more items. Another interesting difference is in the distribution of items across the Positive Social and Habit Strength factors. In the model for the Bulgarian sample the item "I am tempted to smoke when I feel I need a lift" loaded on the Positive social scale and the item "I am tempted to smoke when it is difficult to refuse a cigarette" loaded on the Habit strength scale, while in the measure reported by Plummer et al. (2001) the scales for these two items were reversed. Overall the Positive social scale in the Bulgarian sample seemed to describe more situations associated with stronger pressure from the environment, while the Habit strength scale described situations in which the temptation was associated with a weaker ability of the individual to control the urge to smoke. It seemed harder to make this distinction in the original scale.

As a last step in the measurement development process both of the measures were compared across the two samples used for exploratory and confirmatory work. The results of the multiple samples invariance testing indicated parallel invariance for Decisional Balance, providing evidence that parameter estimates are equal across groups. For the Temptation measure the Lambda invariant model was preferred. Formally this finding indicates that the models have the same factor structure and item loadings, but different variances across the exploratory and confirmatory samples. Such results suggest that the two samples must be treated as arising from different populations. However in the social sciences while the existence of higher levels of measurement invariance are acknowledged, the presence of factorial invariance is considered the necessary condition for comparisons across groups (Cheung& Rensvold, 1999). Since the two samples were derived from a random selection from the same population, it is more likely that the failure of the Temptations scale to reach the highest level of invariance was due to sampling error rather than to actual differences in the population. The invariance of the two tests was also examined across gender groups and the Lambda invariant model was retained for Decisional Balance and the Tau equivalent model for Temptations. Since factorial invariance was established for both measures they can be used to compare results across gender.

Relationship of the constructs with stages of change

Consistent with expectations the percentage of students in the precontemplation (60%) was very high and the number of participants planning to take immediate steps to stop smoking was negligible. The distribution of current smokers across the stages of change was very different from the distributions reported in US samples (Velicer, et al. 1995), with much higher percentage in Precontemplation (60% vs. 40%) and a much lower percent in

Preparation (1% vs. 20%). A variety of factors may play a role and contribute to these differences. The most obvious one is the social environment allowing for easy access and unrestricted consumption of cigarettes. The factors that contribute to this climate are: the low level of enforcement of bans for sales of cigarettes to minors, the low cost of cigarettes and the large number of public places where smoking is allowed. In such a setting smoking it is easy to perceive smoking more as an acceptable social norm than as a hazardous behavior. The lack of active smoking cessation and prevention programs in Bulgarian society can also play an important role and provide explanation for the fact that the majority of Bulgarian adolescents do not consider quitting smoking. Another possible explanation for the extremely high number of people in Precontemplation may be cultural differences. A possible hypothesis is that some differences exist in the way that plans for future behaviors are conceptualized with more focus on the present than the future. Such an explanation however needs additional studies to be developed further. Finally there is the possibility of problems with the measurement of stages. Most notably the selected time frame (plan to quit in the next 30 days) was not specifically tested for the studied population and may be the cause of the observed low percentage of people in the Preparation stage. Whatever the reason, the results suggest that future smoking cessation interventions need to take into account the overall lack of readiness and willingness to quit among Bulgarian adolescents.

When the relationship between Decisional Balance and stages of change was examined the theoretical predictions were confirmed. The Pros of smoking decreased and the Cons of smoking increased from Precontemplation to Maintenance. The sizes of these effects, however, were smaller than the ones reported by Plummer et al. (2001) and the data failed to conform to the strong and weak principles of change (Prochaska, 1994). The strong

principle applied to smoking cessation states that the Cons of smoking will increase by 1 SD from Precontemplation to Action and in the current study the comparable increase was .45 SD. The weak principle states that the Pros of smoking will decrease by a half of a standard deviation and in the current study the decrease for overall Pros was .17 SD. Consistent with the report of Plummer et al. (2001) the Coping Pros had a stronger effect (a decrease of .52 SD) than the Social Pros, which stayed essentially unchanged across stages. The Coping Pros scale was the only one that followed the weak principle of change in this sample. The weaker effect sizes in this study may be due to the unusual stage distribution discussed above, measurement problems or cultural variations, but without further studies no definitive statements can be made.

The results on the relationship of the Temptation scale with stages of change closely replicated previous findings (Plummer et al. 2001) and followed theoretical predictions. The overall temptation scales and all the subscales showed a linear decreasing trend across the stages of change with no significant variation in the pattern. While this finding indicates that no difference exists in the subscale across the stages of change, interventions need to take into account the fact that for individuals the various subscales may have different importance.

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Table 2.1. PCA loadings for DB smokers

Items	Components		
	Social Pros	*Coping Pros*	*Cons*
[redacted]o smoke have more friends.	.703		
People who smoke look more mature.	.633		
Kids who smoke go out more.	.752		
It's easier to meet new people if you smoke.	.735		
Kids who smoke have more fun.	.720		
Smoking cigarettes is pleasurable.		.753	
Smoking cigarettes relieves tension.		.890	
Smoking a cigarette makes it easier to handle bad moments.		.840	
Smoking can affect the health of others.			.711
Cigarette smoke bothers other people.			.736
Smoking is a messy habit.			.815
Smoking makes teeth yellow.			.838
Smoking makes people sick.			.743
[redacted]ng ruins the skin of my face.			.703

Table 2.2. Chi-squares and df for the Decisional Balance scale

[redacted]el	DF	Exploratory sample			
		χ^2	*CFI*	*RMSEA*	*AASR*	*RMS*
[redacted]rrelated (A)	77	152.60	.884	.088	.09	.201
Correlated Pros (B)	76	145.02	.894	.085	.08	.181
Fully correlated (C)	74	137.37	.904	.081	.05	.125
		Confirmatory sample				
		χ^2	*CFI*	*RMSEA*	*AASR*	*RMS*
Uncorrelated (A)	77	129.79	.905	.075	.10	.225
Correlated Pros (B)	76	117.41	.925	.067	.08	.186
Fully correlated (C)	74	102.46	.949	.057	.05	.066

Chi square difference tests for the models

		Exploratory	*Confirmatory*
A - B	1	7.58	15.38
B - C	2	7.65	11.95

Table 2.3. PCA loadings for Temptations

Items	Components			
	Negative Affect	*Positive Social*	*Weight Control*	*Habit strength*
I'm very angry about something or someone.	.856			
When things are not going my way and I'm frustrated.	.670			
When I'm waiting for someone or somebody too long.	.672			
When something irritates me.	.783			
When my friends offer me a cigarette.		.755		
When I feel I need a lift.		.849		
When everybody around me smokes.		.677		
When I am afraid I might gain weight.			.848	
When I want to get thinner.			.889	
When I want to eat less.			.839	
When it is difficult to refuse a cigarette.				.823
When I realize I haven't smoked for awhile.				.780

Table 2.4. Chi-squares and df for the Temptations scale

	DF	Exploratory sample			
		χ^2	*CFI*	*RMSEA*	*AASR*	*RMS*
[redacted]or hierarchical (A)	62	124.23	.927	.089	.04	.061
4 independent factors(B)	65	233.83	.788	.143	.21	.275
4 correlated factors (C)	59	105.48	.942	.079	.04	.064
4 factors hierarchical (D)	50	87.03	.951	.077	.04	.06
		Confirmatory sample				
		χ^2	*CFI*	*RMSEA*	*AASR*	*RMS*
4 independent factors(B)	65	207.69	.760	.136	.17	.223
4 correlated factors (C)	59	131.74	.878	.102	.06	.085
4 factors hierarchical (D)	50	109.49	.893	.100	.10	.084

Chi square difference tests for the models

		Exploratory	*Confirmatory*
B - C	6	128.35	75.95
C - D	9	18.45	22.25

Table 2.5. Summary of multiple sample models results within the sample of smokers

Exploratory and Confirmatory Sample Construct	Model	CFI	RMSEA	χ^2	df	χ^2/df	χ^2diff. (df)	p	ΔCFI
Decisional Balance									
Congeneric	**A**	.923	.050	244.17	151	1.62			
Lambda Invariant	**B**	.931	.046	244.47	161	1.52	.3(10)	**ns**	-.008
Tau Equivalent	**C**	.929	.046	250.32	165	1.52	5.85(4)	**ns**	-.002
Parallel	**D**	**.921**	**.046**	**275.67**	**180**	**1.53**	**25.35(15)**	**ns**	**-.008**
Temptations									
Congeneric	**A**	.927	.063	196.52	100	1.97			
Lambda Invariant	**B**	**.927**	**.060**	**203.34**	**108**	**1.88**	**6.82 (8)**	**ns**	**0**
Tau Equivalent	**C**	.916	.064	222.25	112	1.98	18.91 (4)	**< .05**	-.011
Parallel	**D**	.908	.062	248.79	128	1.94	26.54(16)	**< .05**	-.008

Males and Females Construct	Model	CFI	RMSEA	χ^2	df	χ^2/df	χ^2diff. (df)	p	ΔCFI
Decisional Balance									
Congeneric	**A**	.905	.054	258.76	151	1.71			
Lambda Invariant	**B**	**.913**	**.050**	**259.88**	**161**	**1.61**	**1.12 (10)**	**ns**	**-.008**
Tau Equivalent	**C**	.890	.055	289.28	165	1.75	29.4 (4)	< .05	-.023
Parallel	**D**	.845	.06.	356.17	180	1.98	66.89 (15)	< .05	-.045
Temptations									
Congeneric	**A**	.931	.060	189.05	100	1.89			
Lambda Invariant	**B**	.928	.059	200.90	108	1.86	11.85 (8)	ns	-.003
Tau Equivalent	**C**	**.925**	**.059**	**208.55**	**112**	**1.86**	**7.65 (4)**	**ns**	**-.003**
Parallel	**D**	.911	.061	242.47	128	1.89	33.92 (16)	< .05	-.014

Table 2.6. Standardized T scores (M=50, SD=10) for Temptations to smoke, Cons, Social Pros and Coping Pros

	PC N=124	C/PR N=83	A N=28	M N=27	Post hoc Tukey comparisons
Raw M (sd)	23.17 (5.8)	25.70 (5.7)	24.68 (5.2)	25.96 (4.6)	
M	47.89	52.30	50.52	52.77	PC < C/PR
SD	10.22	9.9	9.08	8.03	
Social Pros					
Raw M (sd)	9.19 (4.6)	10.07 (5.5)	9.71 (4.6)	9.77 (5.0)	
M	49.14	50.91	50.19	50.32	ns
SD	9.37	11.15	9.24	10.15	
Coping Pros					
Raw M (sd)	10.52 (3.0)	9.69 (3.2)	8.75 (3.4)	8.46 (4.3)	
M	52.00	49.55	46.76	45.88	PC > A, M
SD	9.06	9.71	10.25	12.67	
Combined Pros					
Raw M (sd)	19.71 (6.2)	19.5 (6.8)	18.57 (6.2)	18.00 (8.1)	
M	50.53	50.20	48.79	47.92	ns
SD	9.36	10.41	9.41	12.29	
Temptations					
Raw M (sd)	36.36 (9.8)	35.6 (10.2)	27.17 (9.7)	23.6 (12.6)	
M	52.26	51.64	43.95	40.71	PC, C/PR > A, M
SD	8.87	9.24	8.79	11.15	
Positive Social					
Raw M (sd)	9.33 (3.2)	8.8 (2.9)	7.17 (3.5)	5.6 (3.0)	
M	52.26	50.70	45.81	41.10	PC, C/PR > M
SD	9.63	8.74	10.46	8.86	PC > A
Weight					
Raw M (sd)	6.18 (3.8)	6.34 (4.1)	4.5 (2.4)	4.57 (3.3)	
M	50.70	51.12	46.28	46.48	ns
SD	10.14	10.79	6.36	8.56	
Habit strength					
Raw M (sd)	6.31 (2.5)	5.9 (2.6)	4.71 (2.6)	3.92 (2.7)	
M	52.01	50.44	45.98	42.99	PC, C/PR > M
SD	9.32	9.83	9.61	10.05	PC > A
Negative affect					
Raw M (sd)	15.39 (3.9)	15.16 (4.2)	10.96 (4.4)	9.31 (5.6)	
M	52.53	52.04	43.18	39.69	PC, C/PR > A, M
SD	8.24	8.91	9.4	11.7	

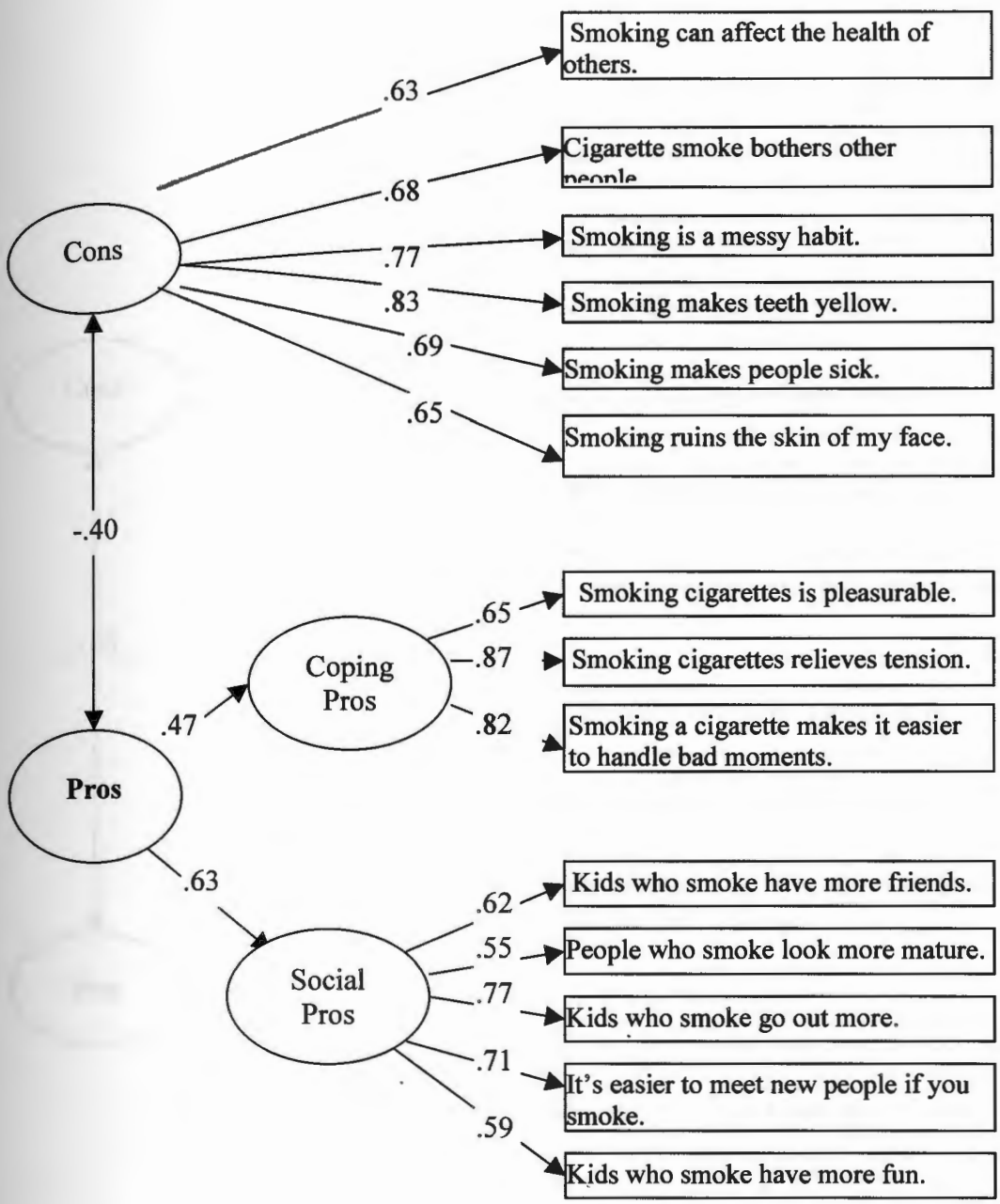

Figure 2.1. Hierarchical model for the Decisional Balance scale (Exploratory sample)

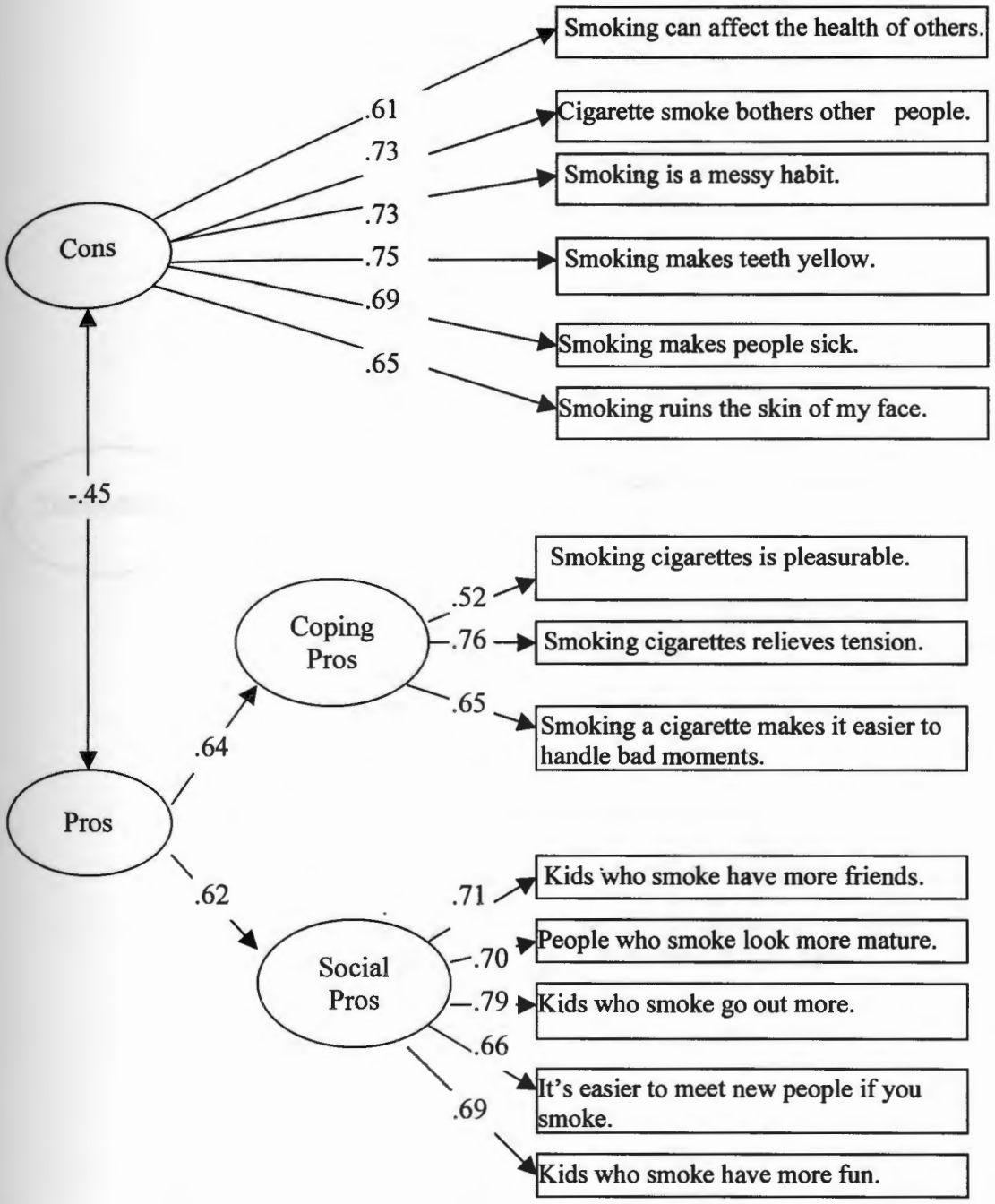

Figure 2.2. Hierarchical model for the Decisional Balance scale (Confirmatory sample)

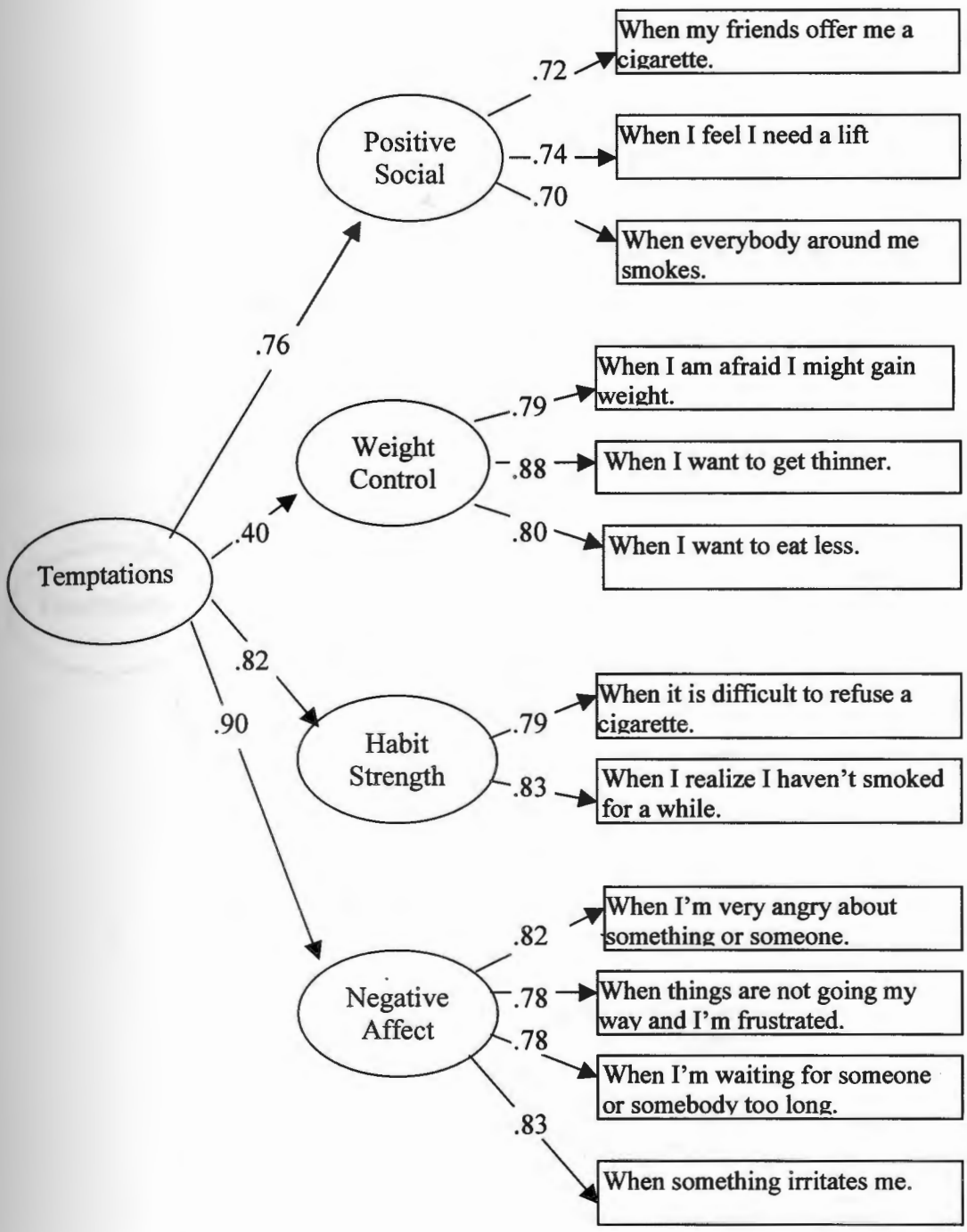

Figure 2.3. Four factor hierarchical model for Temptations to smoke (Exploratory sample)

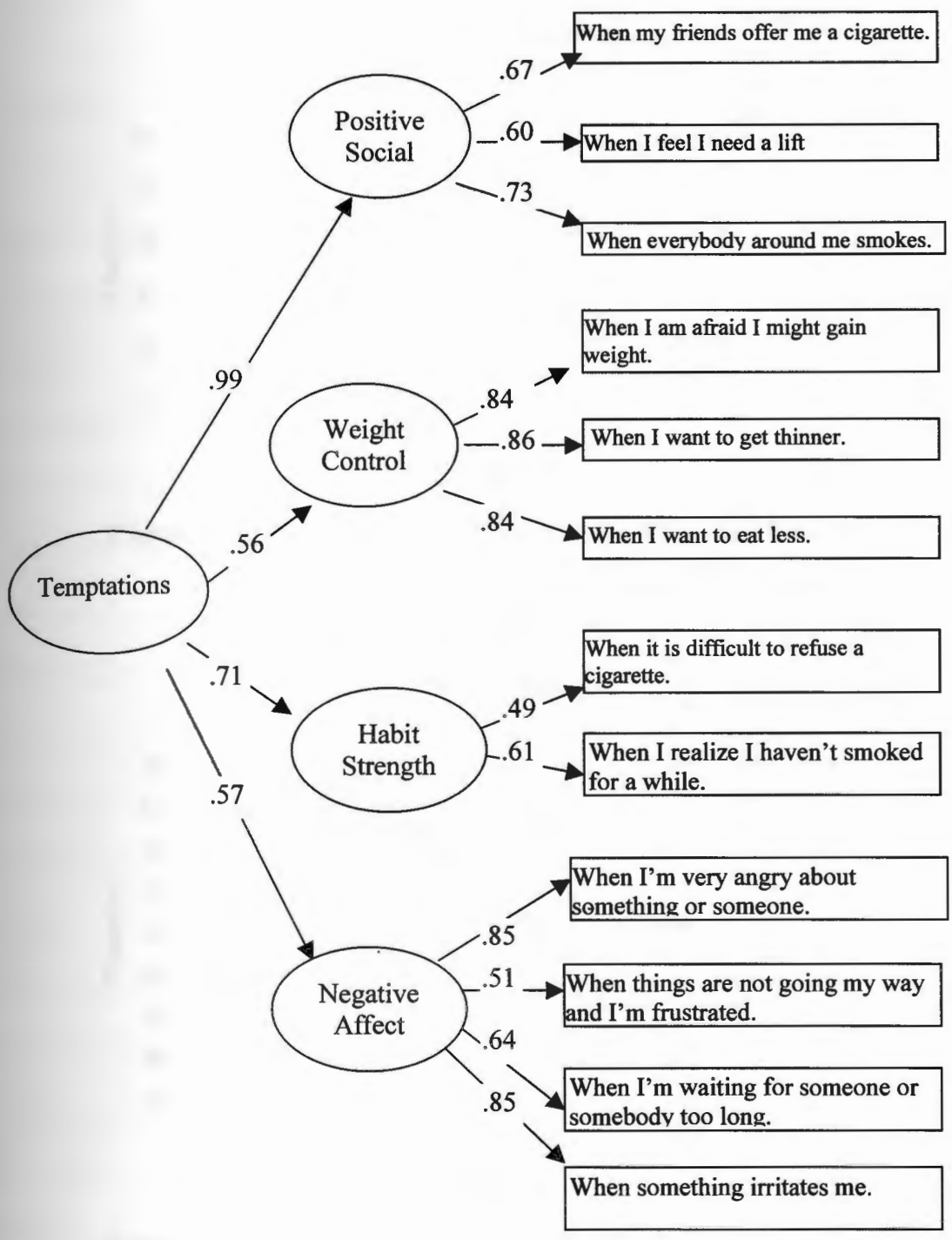

Figure 2.4. Four factor hierarchical model for Temptations to smoke (Confirmatory sample)

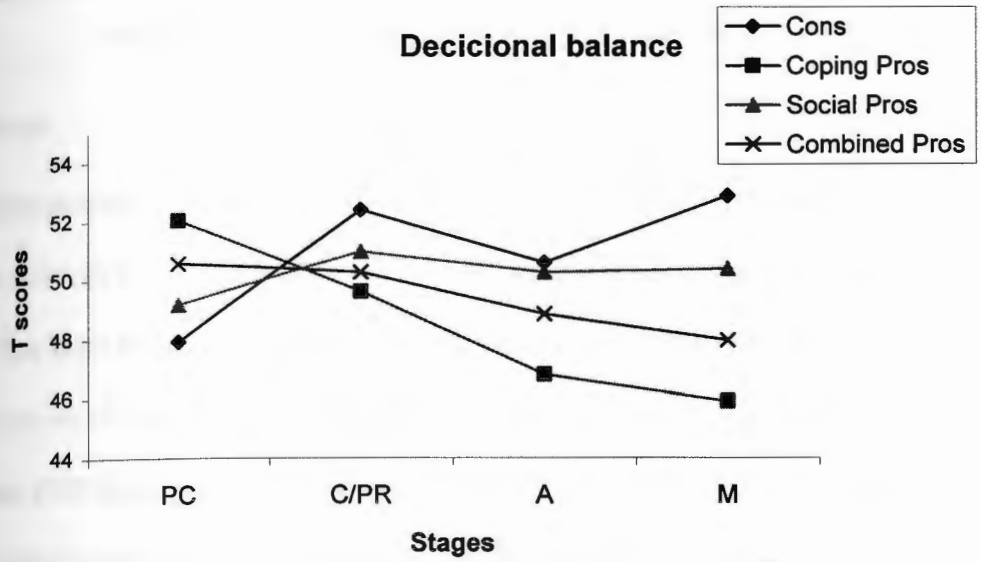

Figure 2.5. Standardized T score pattern for Decisional Balance

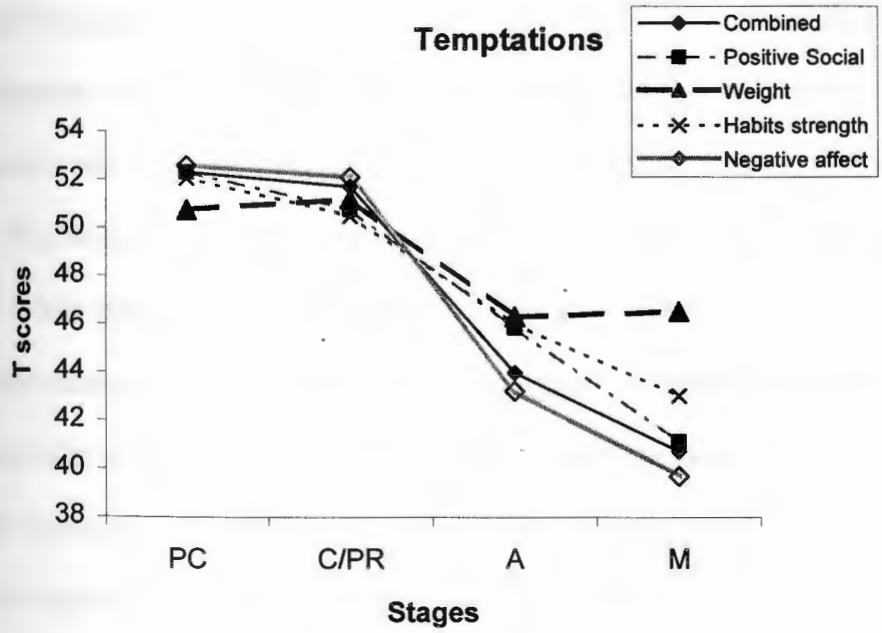

Figure 2.6. Standardized T score pattern for Temptations

Chapter 3: Development and Validation of Measures for Decisional Balance and Self-efficacy for Bulgarian Adolescent Nonsmokers

Introduction

Since smoking is acknowledged as one of the leading preventable causes of premature death in the world (WHO, 2002) considerable research has focused on this problem. The facts indicate that smoking initiation for adult users usually occurs during adolescent years (Fiore, 1992) and smoking is unlikely to occur if it is not started during adolescence (US Surgeon General, 1994). At the same time it is estimated that around 50% of teenage youth that initiate smoking remain addicted for 16 to 20 years (Najem, Batuman, Smith, & Feuerman, 1997). Therefore the development of quality prevention programs for teenagers is very important. However prevention programs create specific challenges for researchers. The first problem comes from difficulties with defining the target population. Since there are people in the population who would never attempt smoking one could argue that the efforts need to focus on the individuals at risk for initiation. The second problem from a behavior change perspective is defining the target behavior. While smoking cessation programs target people who practice an unhealthy behavior and attempt to help them break the vicious cycle of addiction, in prevention the focus needs to be on maintenance of a "lack of the negative behavior" – a concept that is difficult to operationally define in practice. Despite these problems it is clear that prevention programs are needed for adolescent populations and ideally interventions should be theory based, so that potential effects can be better understood and explained.

The Transtheoretical model of behavioral change (Prochaska and DiClemente, 1983) can provide a meaningful theoretical framework for prevention programs. Although initially the model was applied to smoking cessation and extensive research has been conducted in this area, recently the model has also been successfully applied to smoking prevention (Plummer et al., 2001, Pallonen, Velicer et al., 1998).

The meaning of the core TTM constructs in the context of smoking prevention are quite different than their meaning for smoking cessation, since the target behavior is operationalized as "commitment to stay smoke free". In this context, the stages of change reflect an individual's readiness to make such a commitment. According to the model change is a process that goes through five stages: precontemplation, contemplation, preparation, action and maintenance. People in the precontemplation and contemplation stages will be less ready to make a commitment to remain smoke-free and thus, at higher risk for starting smoking. The decisional balance is the construct that indicates the relative weight a person ascribes to pros or cons of staying smoke free. The two-factor structure of this scale has been validated with a sample of US adolescents (Anatchkova et al., 2002; Plummer et al.2001).

The self-efficacy construct is presented by the temptation scale, which in this context measures the degree of temptation to try smoking cigarettes in specific situations. The study of Plummer et al. (2001) postulated and confirmed a four-factor structure for this scale.

While some research has been done on the validity of the TTM constructs for non-smokers with American adolescents, there have been no validation studies with populations in other countries. Thus the goals of this project are to develop measures for two of the three key TTM constructs (decisional balance and self-efficacy) and examine

their validity for Bulgarian adolescent nonsmokers. Thus, the study will also provide external cross-cultural validation for the TTM constructs applied to smoking prevention.

Methods

Procedure

The sample for this project consisted of students in the last grades of high school (15-19 years old) recruited in 12 randomly selected high schools of the two largest cities in Bulgaria (Sofia and Plovdiv). The University of Rhode Island Institutional Review Board approved all data collection protocols prior to the start of recruitment. The schools were selected to represent the major school types in the country (with general, technical and humanitarian profile). The principals of 15 schools were approached with a request for participation. Two of the schools declined due to the approaching end of the semester and in one of the schools the students had recently participated in a different study exploring risky behaviors. Once permission was obtained from the principal of a school, further arrangements were made with a teacher for the exact time of the data collection. The investigator administered all the survey materials. All participants were presented an assent or consent form prior to their participation and were offered a small incentive (a set of notebooks and pens) for their time. The survey materials were distributed along with a white envelope in which participants sealed and returned their anonymous answers. None of the students declined participation and only 5 empty cards were returned.

Measures

The full battery consisted of a number of measures translated for the first time in Bulgarian and used with a Bulgarian sample. The majority of the measures reflected TTM constructs. In addition some stress and family influence measures, as well as items related to

tobacco related marketing and peer influences were included to answer some specific research questions. All participants were presented with the full battery of instruments. The first part, including the demographics and the stress questions, was the same for all participants. After that, depending on their smoking status participants were guided through a skip pattern to one of two different sets of items for smokers and for nonsmokers. Only the measures relevant for nonsmokers will be presented here.

Smoking Status Question: Two questions were used to determine the smoking status of participants. The first divided subjects into ever smokers and never smokers. The second differentiated between never smokers, regular smokers, experimental smokers and quitters. Depending on his or her smoking status each participant received a battery of TTM measures. The never smokers and the experimental smokers were collapsed into the group of nonsmokers and received the scales, assessing their readiness to make commitment to remain smoke free. The analyses presented below are based on this sample.

Stages of change for staying smoke free: This scale for smoking acquisition (6 items) is measuring participants determination to stay smoke-free and hence their risk of becoming a smoker (Anatchkova et al., 2002).

Decisional Balance for staying smoke free: The scale contains equal numbers of pros and cons of being smoke-free (Anatchkova et al., 2002). The instrument measures the importance of each statement in the individual's decision to stay smoke free. Additional culturally tailored items were included in the initial pool to bring the total number of items to 23.

Temptations for attempting smoking: The scale is based on the existing four factor English language instrument (Plummer et al. 2001). The measure is designed to measure the strength of temptation to try smoking in specific situations. As with the decisional balance scale new culturally tailored items were also included in the initial pool bringing the total number to 17 items.

Analytic Plan

For the measurement development and validation of the smoking prevention measures, only the group of 369 nonsmokers was used. This sample was randomly split in half. One half of the sample was used for exploratory item analysis, PCA and exploratory model testing. The second half was used for confirmatory analysis using SEM. Finally, factorial invariance of the two measures was evaluated across both halves of the sample and across gender. The external validation of the scale was performed through examination of the relationship of the scales and the stages of change for making a commitment to stay smoke-free.

Results

Participants

Six hundred and seventy three students participated in the study. In an open-ended question on ethnicity the vast majority (96.8%) of the students self identified as Bulgarians. The rest (3.2%) pointed out various religious and/or national identities. The sample was 64% female, equally distributed across the included age range, 47.8% reported a GPA equivalent to A and 41.0% were ever smokers. For the measurement development and validation of the smoking prevention measures, only nonsmokers were included, which reduced the sample size to 369 (61.8% female, mean age 16.4 years). In the group of nonsmokers 97.1%

identified themselves as Bulgarian, 58.6% reported a GPA of 6 (equivalent to A) and 84.1% percent planned to apply to colleges in the country and abroad (See Table 1.1).

Decisional Balance Measure for nonsmokers

For the Decisional Balance of being smoke-free scale, seven items were initially excluded due to extreme mean values and nonnormal distribution of responses. A Principal Components Analysis (PCA) was performed on the remaining 16 items. The MAP procedure suggested that a two-factor solution fit the data best. At this stage four additional items were deleted due to low factor loadings. A two-factor solution (Pros and Cons) is consistent with theoretical predictions for the general structure of decisional balance. The final principal components solution consisted of two factors: Cons (5 items) and Pros (7 items) (Table 3.1). The Cronbach's internal consistency values for the Pros (α = .81) and the Cons (α = .74) were good.

In order to find the best fitting model for the measure, both a correlated and an uncorrelated model were explored using structural equation modeling (SEM). In the model building process two additional items were excluded from the Pros scale and one item was excluded from the Cons scale due to poor item loadings. As a result the internal consistency of the Pros was slightly reduced (α = .76), but the alpha for the Cons scale remained the same (α = .74). In the exploratory sample the correlated model demonstrated better fit to the data χ^2 (26) = 38.73, p > .05, CFI = .96; RMSEA=.05 than the uncorrelated model χ^2 (27) = 47.03, p < .05, CFI = .94; RMSEA=.07 (Figures 3.1 and 3.2). The chi-square difference tests showed a significant difference between the two models (χ^2 (1) $_{difference}$= 9.70, p < .05, suggesting improvement in the fit of the correlated model compared to the uncorrelated model.

The two models were also tested in the confirmatory sample. Both models demonstrated good fit to the data (χ^2 (26) = 43.40, p > .01, CFI = .94 and χ^2 (26) = 43.33, p > .05, CFI = .94) and the correlation of the two factors failed to significantly improve the fit of the model. Since a correlated model is consistent with theory and previous findings, demonstrated better fit in the exploratory sample (Fig. 3.1) and in the total sample this was the model retained and presented in Fig. 3.2.

Temptations measure for non smokers

As the items in this measure are designed to measure the temptation to try smoking in a population of non-smokers it was expected that the item distributions would be skewed. Consequently the descriptive statistics of the separate items were not used as criteria for exclusion from the scale and the measurement development proceeded with PCA's with Varimax rotation on all items. The MAP procedure suggested a single factor solution. Since the solution suggested by this method can reflect the hypothesized hierarchical structure of the scale and the skewness of many of the original items, based on theoretical assumptions and previous work three and four factor solutions were explored (Plummer et al., 2001). During the PCA four items were excluded due to complex loadings and two were excluded due to low loadings. In addition when the four factor solution was tested, the fourth factor was weak both in terms of internal consistency and content. As a result the two items included in this factor were also excluded. The final PCA solution consists of three factors with corresponding alphas: Negative affect (α = .71), Positive Social (α = .81) and Weight Control (α = .88). The individual item loadings for the scale are presented in Table 3.3.

As with the previous scale in order to determine the best structure for the scale the sample was split into two subsamples for exploratory and confirmatory measurement models using SEM. Three factor uncorrelated, correlated and hierarchical models were tested in both samples using SEM. Since the Weight control factor consisted of only two items, their loadings were constrained to be equal in all models. In addition, one of the error variances of the items in this scale had to be fixed to enable the computation of a final solution.

In the exploratory sample, the uncorrelated solution had poor fit χ^2 (29) = 107.11, $p < .05$, CFI = .86. The correlated and the hierarchical model had a significantly better fit χ^2 (26) = 56.53, $p < .05$, CFI = .95. The chi-square difference test between the two models suggested a significant improvement for the correlated model (χ^2 (3) $_{difference}$= 50.56, $p < .05$). The variance for the third factor had to be fixed in the hierarchical solution.

These results were replicated in the second half of the sample where the fit of the uncorrelated model was χ^2 (28) = 222.04, $p < .05$, CFI = .70, the fit of the hierarchical model was χ^2 (26) = 86.41, $p < .05$, CFI = .91, and the chi-square difference test result was significant χ^2 (3) $_{difference}$= 136.63, $p < .05$, supporting the correlated, and ultimately the hierarchical factor model. The hierarchical model is consistent with the theoretical construct and previous findings and the correlations among the factor were moderate, the hierarchical models for the exploratory and the confirmatory samples are presented in Figures 3.3 and 3.4 respectively.

Invariance Testing

The logic and sequence of multiple sample analysis used in the invariance testing for the measures for smokers was followed in the invariance testing for non-smokers as well. The summary of the results of the different nested models tested is presented in Table 3.5. For the decisional balance measure the parallel model was retained for the invariance across the exploratory and confirmatory subsamples. Tau-invariance was reached across gender subsamples for both constructs and the Lambda Invariant model was retained for the Temptations scale across both halves of the sample. These decisions were based both on the chi-square difference test and the CFI difference test (Cheung & Rensvold, 2002).

Stage distribution

The stage distribution for being smokefree among nonsmokers (n=369; 55% of total sample) was examined next. Of all nonsmokers, 46 (12.5%) had enough missing item-level data that stage could not be determined. Of the remaining 323 participants, 113 (35.0%) were in Precontemplation, 3 (.9%) were in Contemplation, 9 (2.8%) were in Preparation, 8 (2.5%) were in Action and 190 (58.8%) were in Maintenance. Due to the very small number of participants in Contemplation, Preparation and Action, participants were collapsed in three categories: Precontemplation, combined Contemplation and Preparation, and combined Action and Maintenance.

External Validation

In order to test the external validity of the measures the predictions made for the distributions of these scales across the stages of change. The model predicts a crossover pattern for the Decisional Balance Scale. At the Precontemplation stage, the Cons of

making a commitment to stay smoke free are expected to outweigh the Pros, while in the Maintenance stage the reverse is expected – the Pros of making commitment to stay smoke free are more important than the Cons of that decision. The crossover is expected to occur between the Contemplation and the Preparation stage. For the Temptation measure the theory predicts a gradually decreasing pattern.

The sum of the items within a scale provided the raw score for the measure. The raw scores were standardized to T-scores (M=50, sd=10) and two separate analyses of variance were conducted to examine the patterns for the Decisional Balance and the Temptation scales. Due to the very low number of people in the stages between Precontemplation (PC) and Maintenance the Contemplation and Preparation stages were collapsed into one group C/PR (N =12, 3.7 % of the sample) and people in action were collapsed with people in Maintenance into the A/M group (N = 198, 61.3% of the sample). As a consequence there were only three stage groups included in the analyses instead of the usual five.

Relationship between the Decisional Balance scales and the stages of change

To determine whether the Pros and Cons varied across stage a multivariate analysis of variance (MANOVA) was performed, with stage as the independent variable and Pros and Cons as dependant variables. The results indicated a significant multivariate effect for stage Wilk's $\Lambda = .854$, $p < .001$. The follow up ANOVA's for the Decisional balance scale revealed significant mean differences for both Cons $F(2, 295) = 4.14$, $p < .05$, $\eta^2 = .03$ and Pros $F(2, 296) = 20.87$, $p < .05$, $\eta^2 = .13$. Follow up Tukey tests supported the theoretical prediction that people in the PC stage will have significantly higher Cons than people in the A/M group. For the Pros people in the PC stage had

significantly lower scores than participants in the other stage groups. The magnitude of the effect sizes for the two scales were slightly smaller than the effects reported by Plummer et al. (2001). These results are graphically presented in Figure 3.5 and the means and standard deviations for the scales are presented in Table 3.6.

Relationship between the Temptation scales and the stages of change

A MANOVA was performed to examine the variation of Temptation subscales across stages. The results indicated significant multivariate effect for stage Wilk's Λ = .831, $p < .001$ The ANOVA for the combined Temptations measure produced significant results $F(2, 292) = 21.82$, $p < .05$, $\eta^2 = .13$. Post-hoc comparisons confirmed theoretical predictions for this scale: people in the A/M group reported significantly lower levels of temptations to try smoking than people in the other stage groups.

Temptation subscales were examined next. The Positive Social scale varied significantly across stages $F(2, 292) = 15.640$, $p < .001$, $\eta^2 = .10$. Consistent with theoretical predictions, the Tukey comparisons indicated that people in the PC stage had higher scores than people in the A/M group.

The Negative Affect scale scores were also significantly different across stages $F(2, 296) = 17.81$, $p < .001$, $\eta^2 = .11$ and the pattern provided by the post-hoc tests was identical to the pattern of the combined Temptations scale.

Finally the Weight Control scale failed to reach significance $F(2, 295) = .369$, $p > .05$, $\eta^2 = .003$. The patterns of the Temptation scales are presented in Figure 3.6 and the means and standard deviations are listed in Table 3.6.

Discussion

This study developed and validated measures for Decisional Balance and Self-efficacy for Bulgarian non-smokers. Both measures were psychometrically consistent with the constructs, but differed from previous reports of the measures on adolescents. The external validity of the measures was examined through the relationship of the constructs with the stages of readiness to make a commitment to stay smoke free. The study is an important step in the efforts to apply the TTM to smoking prevention and provides evidence for its applicability to a Bulgarian adolescent sample.

Measurement models

The measurements model for Decisional Balance for nonsmokers had good psychometric properties and demonstrated a two-factor structure: Pros and Cons. This finding is consistent with the theory and previous findings applying the construct to various samples and behaviors (Prochaska, 1994). However these results are different from those reported by Plummer et al. (2001) based on a large sample of US adolescents and examining the Pros and Cons of Smoking, as compared to the Pros and Cons of Being Smokefree in this study. The authors of the previous study did express caution due to the homogenous distribution of participants in that study using a different staging algorithm (90% in a single stage) (Plummer et al., 2001). The findings of the current study are consistent with the TTM, the current model was confirmed as a valid and reliable measure of Decisional Balance. Additional support for this conclusion is provided by previous work with another sample of adolescent nonsmokers (Anatchkova et al. 2002), in which the findings supported a two-factor structure as well.

The measurement model for the Self-efficacy construct resulted in a three-factor structure: Positive Social Situations, Negative Affect and Weight Control. The first two of these factors are traditionally associated with smoking behavior and have been replicated in studies with non-smokers as well (Ding, Pallonen, Migneault, & Velicer, 1994; Pallonen, Prochaska et al., 1998; Plummer et al., 2001). The third factor – Weight Control was proposed by Plummer et al. (2001) and was replicated in the current study. Overall the discovery of a stable structure for the Temptations to try smoking scale seems to pose a challenge to the field. A four-factor (Pallonen, Prochaska et al., 1998) and a five factor (Plummer et al., 2001) structures have been previously reported and the current study found three factors. One of the challenges for the measurement development in this sample was the floor effect discovered for many of the items initially included in the pool and the large number of participants who declared that they have made a firm commitment to stay smoke free, and for them the self-efficacy items seemed irrelevant. Despite these difficulties, the resulting Temptation measure demonstrated sound psychometric properties and reflected the content usually associated with the construct in this Bulgarian sample of nonsmokers.

Invariance testing of both measures across the two split halves of the sample and across gender subsamples provided additional evidence for the stable structure of the Decisional Balance scale, for which the parallel invariance model was preferred across both comparisons. As expected the Temptation scale failed to reach such high levels of measurement invariance. Only congeneric invariance was acceptable for the model comparison across the two subsamples, further indicating that the final structure of the measure may be rather unstable.

Relationship of the constructs with stages of change

One of the possible reasons for the problems with the structure of the Temptations measure is the stage distribution of participants with close to 60% staged in Maintenance (people committed to stay smoke free) and 35.5% in Precontemplation. The high percentage of students in the highest risk group (Precontemplation) was consistent with predictions and underscores the importance of prevention programs that can help this group stay away from cigarettes. However the overall distribution of participants across the stages requires some further exploration. The lack of participants in the middle stages may be due to specifics of the population or problems with the adaptation of the measure and algorithm. However alternative explanation can also be considered. The results of this study suggest the presence of two distinct groups – participants at risk and another group of people "immune" to the temptations of smoking. Since the staging algorithm was developed as an instrument to help in the change of unhealthy behaviors, it may not be as sensitive to changes in idea formation (making a commitment may not be the same as behavior change). If this is the case in the context of smoking prevention the algorithm may need to be refined to identify adolescents at risk and to focus more on the staging of people who have already formed the idea and are planning on action (start smoking), more like the algorithm used in Plummer et al. (2001). Such an algorithm would allow the assessment of risk to initiate the risky behavior and could serve as the basis for tailored interventions for prevention. The question of whether such an algorithm would be more effective than the current one must be answered by future research.

With the caveat of these unequal stage distributions the relationship of Decisional Balance with stage was examined. Consistent with theoretical predictions the Pros of

staying smoke free increased by .84 SD and Cons decreased by .34 SD from precontemplation to Action/Maintenance. For Temptations the expected decline across stages of about .70 SD was observed for all the subscales, except Weight Control. Even though some differentiation seemed to exist in the pattern, the differences are not interpreted as the very small sample size in the combined group C/PR makes results unreliable.

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Table 3.1. Final PCA solution for Decisional Balance for nonsmokers

Items	Loadings	
	Pros	*Cons*
[redacted]ll get into less trouble if I don't smoke.	.620	
I'll keep the air cleaner for everyone if I don't smoke.	.621	
I'll be more attractive without smoking.	.699	
I will be a better role model if I don't smoke.	.769	
I'll do better in school without smoking.	.690	
I'll do better in sports if I don't smoke.	.696	
My parents would be proud of my choice not to smoke.	.612	
I will feel uncomfortable at parties if I don't smoke.		.655
I won't fit in with people who matter to me if I don't smoke.		.703
I will have fewer friends if I don't smoke.		.762
I will have trouble coping with problems without smoking.		.682
I will feel less like an adult if I don't smoke.		.618

Table 3.2. Chi-squares and df for the Decisional Balance scale (Nonsmokers)

[redacted]	DF	Exploratory sample				
		χ^2	*CFI*	*RMSEA*	*AASR*	*RMS*
[redacted]d (A)	27	47.03	.940	.067	.11	.098
Correlated (B)	26	38.73	.962	.054	.04	.060
		Confirmatory sample				
		χ^2	*CFI*	*RMSEA*	*AASR*	*RMS*
Uncorrelated (A)	27	43.40	.939	.063	.04	.056
Correlated (B)	26	43.32	.936	.065	.04	.056

Chi square difference tests for the models

		Exploratory	*Confirmatory*
A-B	1	9.70	.08

Table 3.3. PCA loadings for Temptations to try smoking (Nonsmokers)

	Negative Affect	*Positive Social*	*Weight Control*
[redacted]s are not going my way and I am frustrated	.773		
When I am very anxious and stressed.	.767		
When I am too worried about an exam at school	.734		
When others are talking about how much they like smoking.		.790	
When I am having a good time.		.721	
When I want to be part of the crowd.		.776	
When somebody I am attracted to smokes cigarettes.		.776	
When I am afraid I might gain weight.			.898
[redacted]nt to get thinner.			.911
[redacted]	**.81**	**.71**	**.88**

Table 3.4. Chi-squares and df for the Temptations scale (Nonsmokers)

[redacted]	**DF**	**Exploratory sample**				
[redacted]		χ^2	*CFI*	*RMSEA*	*AASR*	*RMS*
[redacted] uncorrelated (A)	29	107.11	.864	.127	.14	.192
3 factors correlated (B)	26	56.53	.947	.084	.04	.071
		Confirmatory sample				
		χ^2	*CFI*	*RMSEA*	*AASR*	*RMS*
3 factors uncorrelated (A)	29	222.04	.706	.204	.22	.304
3 factors correlated (B)	26	86.41	.901	.121	.04	.076

Chi square difference tests for the models

		Exploratory	*Confirmatory*
A-B	3	50.58	136.63

Table 3.5. Summary of multiple sample models results for nonsmokers

Exploratory and Confirmatory Sample

Construct	Model	CFI	RMSEA	χ^2	df	χ^2/df	χ^2diff. (df)	p	ΔCFI
Decisional Balance									
➢ Congeneric	**A**	.950	.042	82.06	52	1.58			
➢ Lambda Invariant	**B**	.948	.041	90.65	59	1.54	8.59 (7)	**ns**	-0.002
➢ Tau Equivalent	**C**	.947	.040	94.19	62	1.52	3.54 (3)	**ns**	-0.001
➢ **Parallel**	**D**	**.949**	**.037**	**101.72**	**71**	**1.43**	**7.53 (9)**	**ns**	**0.002**
Temptations									
➢ Congeneric	**A**	.938	.069	126.52	50	2.53			
➢ **Lambda Invariant**	**B**	**.932**	**.068**	**139.99**	**56**	**2.50**	**13.47 (6)**	**< .01**	**-0.006**
➢ Tau Equivalent	**C**	.898	.081	184.46	59	3.13	44.47 (3)	**< .05**	-0.034
➢ Parallel	**D**	.872	.083	227.75	70	3.25	43.29 (11)	**< .05**	-0.026

Males and Females

Construct	Model	CFI	RMSEA	χ^2	df	χ^2/df	χ^2diff. (df)	p	ΔCFI
Decisional Balance									
➢ Congeneric	**A**	.964	.036	73.25	52	1.41			
➢ Lambda Invariant	**B**	.957	.037	84.48	59	1.43	11.23 (7)	**ns**	-0.007
➢ **Tau Equivalent**	**C**	**.956**	**.036**	**87.88**	**62**	**1.42**	**3.40 (3)**	**ns**	**-0.001**
➢ Parallel	**D**	.901	.051	129.70	71	1.83	41.82 (9)	**< .05**	-0.055
Temptations									
➢ Congeneric	**A**	.932	.073	137.46	50	2.75			
➢ Lambda Invariant	**B**	.926	.072	150.95	56	2.70	13.49 (6)	**ns**	-0.006
➢ **Tau Equivalent**	**C**	**.925**	**.071**	**155.68**	**59**	**2.64**	**4.73 (3)**	**ns**	**-0.001**
➢ Parallel	**D**	.888	.080	214.92	70	3.07	59.24 (11)	**< .05**	-0.037

Table 3.6. Standardized T scores (M=50, SD=10) for Temptations to try smoking, Pros and Cons of being smoke-free (Nonsmokers)

	PC N=106	C/PR N=12	A/M N=178	Post hoc Tukey comparisons
Raw M (sd)	9.14 (4.5)	8.66 (3.4)	7.7 (3.5)	
M	52.10	50.90	48.62	PC > A/M
SD	11.34	8.48	9.00	
Pros				
Raw M (sd)	21.19 (6.3)	26.58 (7.1)	26.16 (6.3)	
M	45.36	53.20	52.59	PC < C/PR, A/M
SD	9.24	10.43	9.23	
Temptations				
Raw M (sd)	15.17 (6.7)	14.91 (5.9)	11.47 (4.3)	
M	54.54	54.34	46.99	PC, PR/C > A/M
SD	12.20	10.98	7.40	
Positive Social				
Raw M (sd)	7.26 (3.7)	6.58 (3.7)	5.18 (2.4)	
M	54.17	51.38	47.48	PC > A/M
SD	11.97	11.90	7.9	
Negative Affect				
Raw M (sd)	5.45 (2.9)	5.66 (2.6)	3.91 (1.6)	
M	53.92	54.82	47.27	PC, PR/C > A/M
SD	12.42	11.23	7.11	
Weight Control				**ns**
Raw M (sd)	2.56 (1.7)	2.66 (1.6)	2.43 (1.2)	
M	50.44	51.20	49.52	
SD	12.33	11.11	8.58	

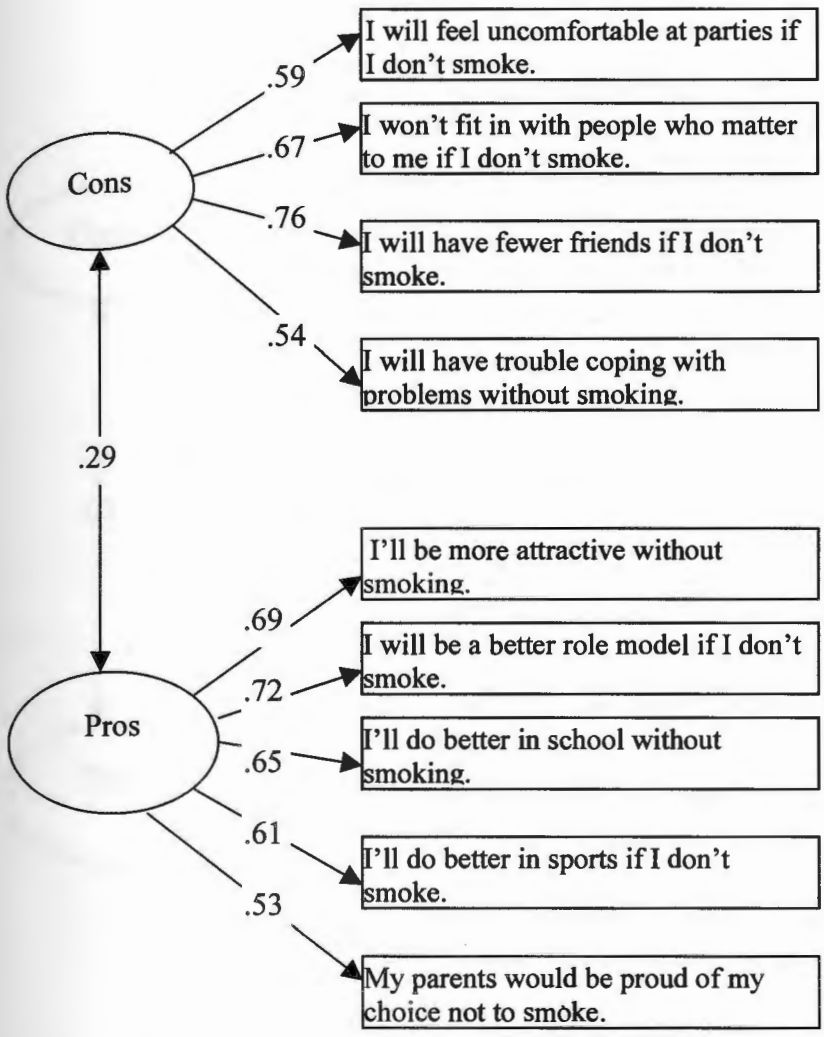

Figure 3.1. Decisional Balance scale for nonsmokers (Exploratory Sample)

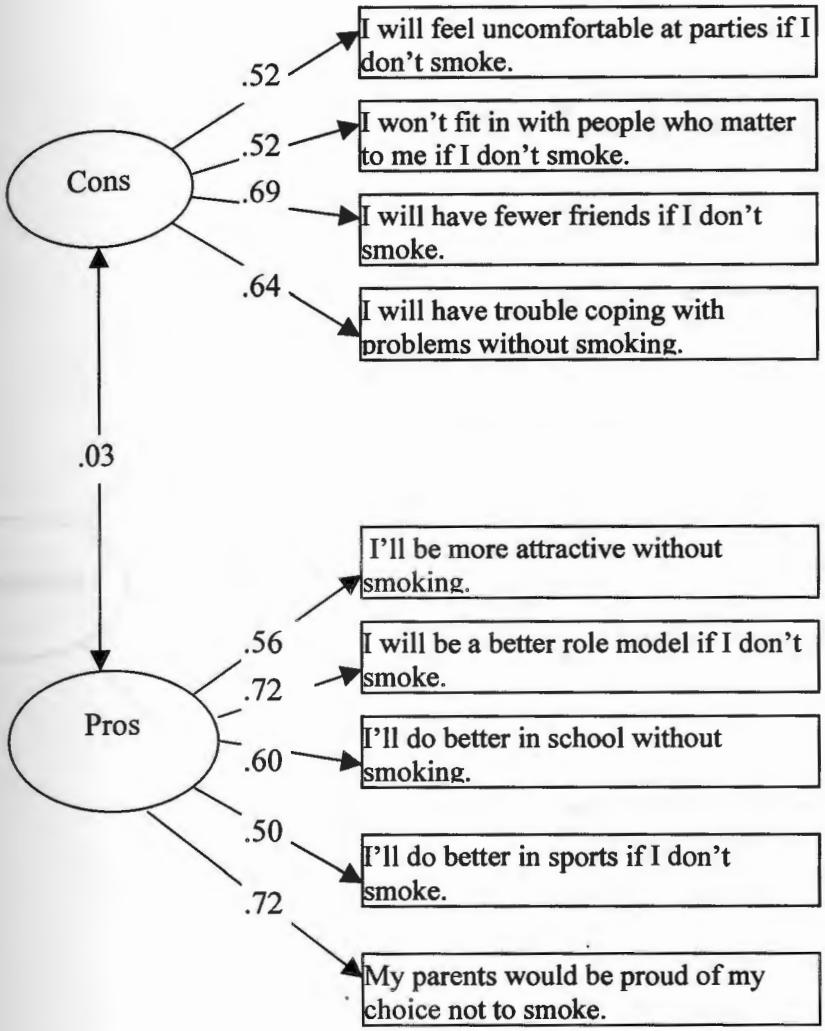

Figure 3.2. Decisional Balance scale for nonsmokers (Confirmatory Sample)

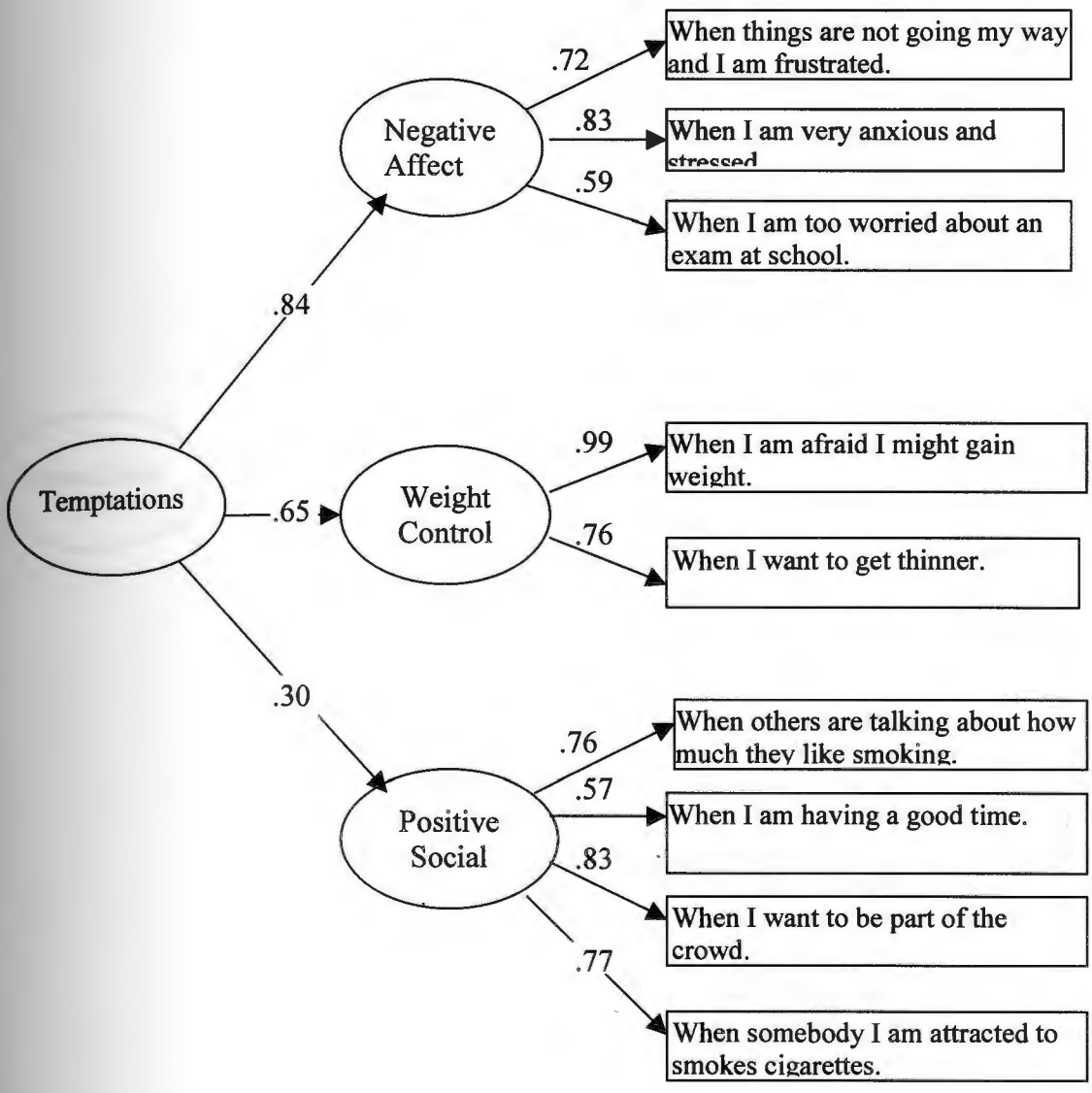

Figure 3.3. Three factor hierarchical model for Temptations to try smoking (Exploratory sample)

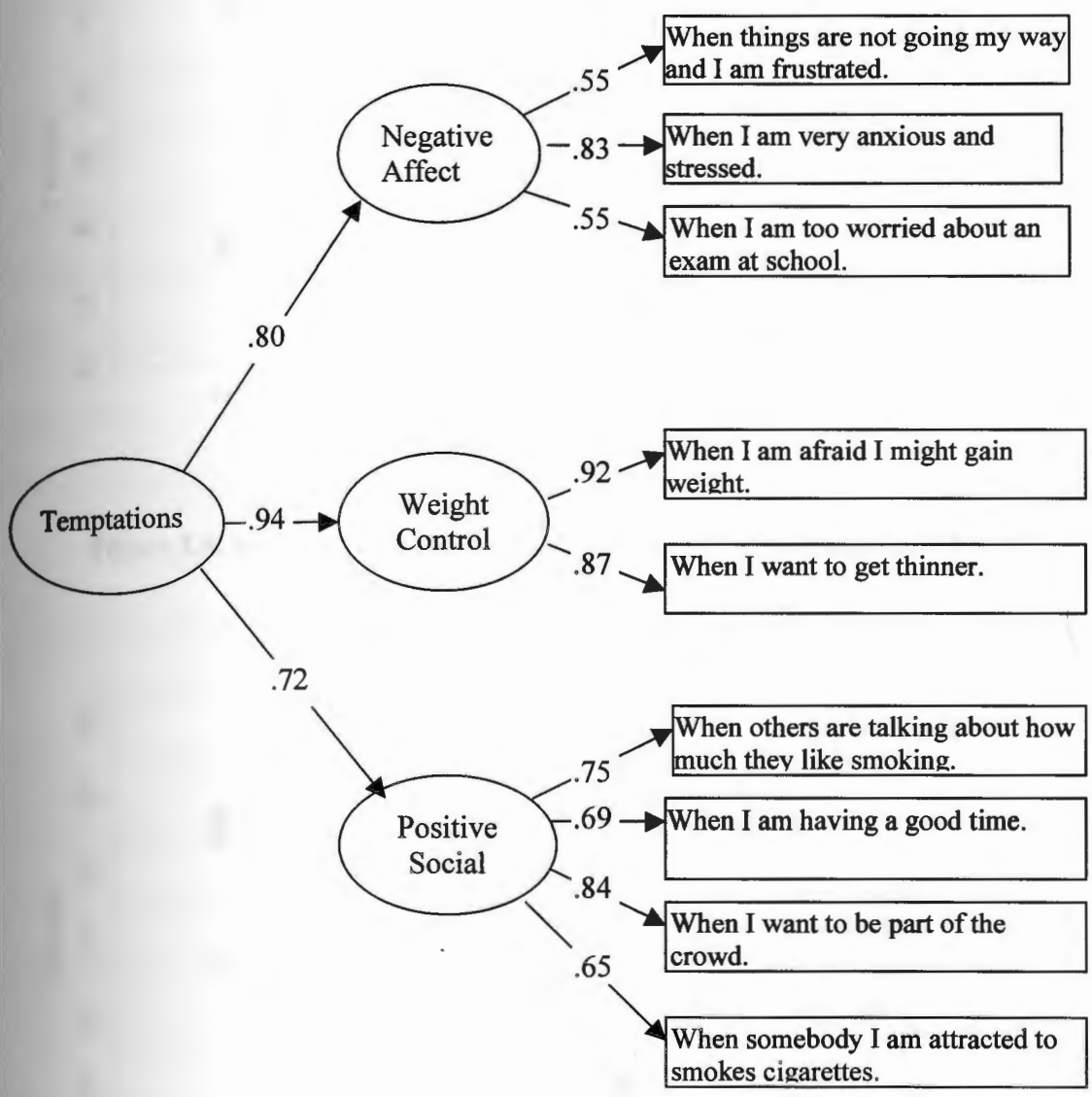

Figure 3.4. Three factor hierarchical model for Temptations to try smoking (Confirmatory sample)

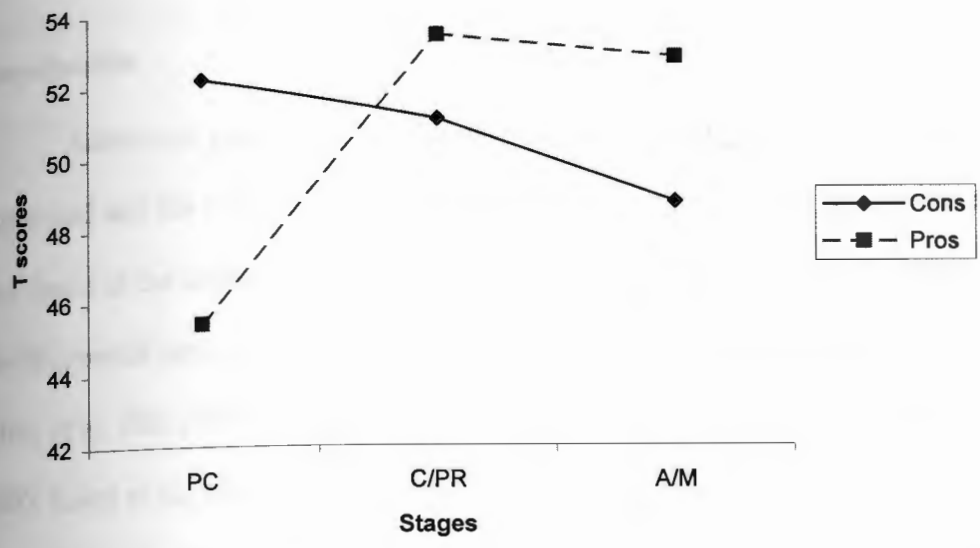

Figure 3.5. Standardized Decisional Balance scores by Stages of Change

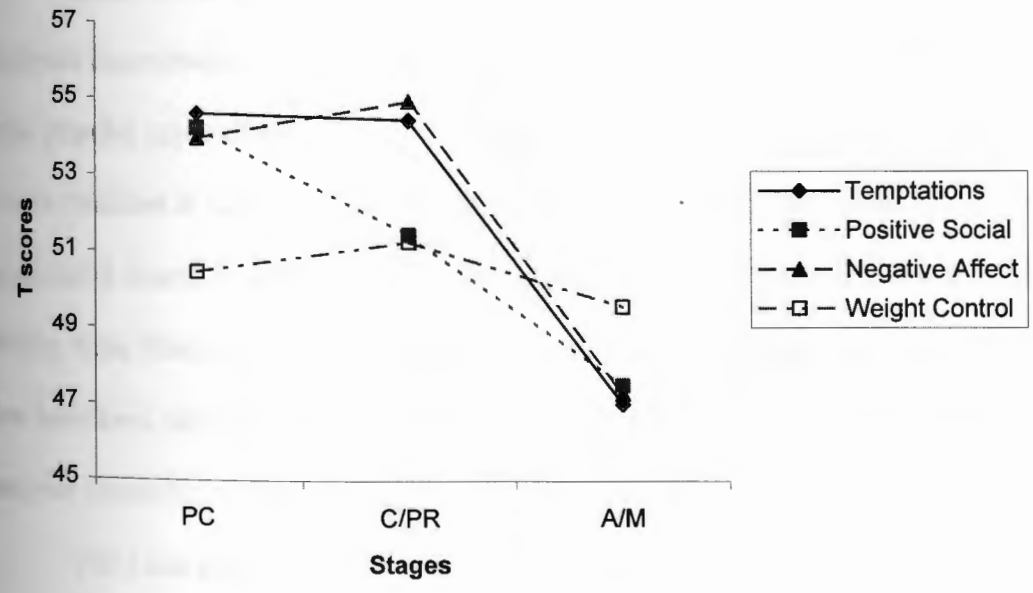

Figure 3.6. Standardized Temptations scores by Stages of Change

Chapter 4. Validation of Stress Measures for Bulgarian Adolescents

Introduction

Adolescent years are described as a period of major changes in the life of an individual and the offset point for many problem behaviors. Stress is considered to be a risk factor in the development of a variety of health and social problems during this developmental period, such as substance abuse (Goeders, 2003), alcohol consumption (Bray et al. 2001; Wills, Ashby et al, 2002; Wills, Sandy et al, 2002), smoking (Enomoto, 2000; Koval et al., 2000), anxiety (Comeau et al. 2001; Henker et al. 2002), suicide ideation (Huff, 1999), and depression (Carter & Clayton, 1995; Yarcheski, 2000) among others. The direct and indirect influence of stress on health has also been well documented (Herbert & Cohen, 1994).

Stress is one of the most widely studied topics in psychology and a number of different conceptualizations and theories of stress are coexisting in the field. Some of the most popular approaches to the study of stress are through the study of stressful life events (Holmes & Rahe, 1967), study of daily hassles (Kanner et al, 1981), cognitive appraisal (Lazarus & Folkman, 1984) and levels of perceived stress (Cohen et al. 1983). Within these frameworks many English language instruments have been proposed, but few have been validated with culturally diverse samples and even fewer for Bulgarian samples (Anatchkova, 1998).

Valid and reliable measures are essential in the study of stress and the goal of this study is to test the validity of two measures for stress and coping and a TTM based stage algorithm for effective stress management for Bulgarian adolescents. None of the instruments has been tested before with this population. It is interesting to examine the

validity of these stress measures in a context characterized with greater socio-political changes and different challenges for adolescents (Botcheva, 2002).

Methods

Procedure

The University of Rhode Island Institutional Review Board approved all data collection protocols prior to the start of recruitment. The schools were selected to represent the major school types in the country (with general, technical and humanitarian profile). The principals of 14 schools were approached with request for participation. Two of the schools declined due to the approaching end of the semester and in one of the schools the students had recently participated in a different study exploring risky behaviors. After permission was obtained from the principal of a school, further arrangements were made with a teacher for the exact time of the data collection. The investigator administered the survey materials. All participants were presented an assent or consent form prior to their participation and were offered a small incentive for their time. The survey materials were distributed along with a white envelope in which participants sealed and returned their anonymous answers. None of the students declined participation and only 5 empty cards were returned. Item analysis was performed on the complete sample. After that the sample was split in half. One half was used for PCA and exploratory model testing. The second half was used for confirmatory factor analysis using SEM.

Measures

The full battery consisted of a number of measures translated for the first time in Bulgarian and used with a Bulgarian sample. The majority of the measures were TTM constructs. In addition some stress and family influence measures, as well as items related to

tobacco related marketing and peer influence were included to answer some specific research questions. All participants were presented with the full battery of instruments. The first part, including the demographics and the stress questions, was the same for all participants. After that, depending on their smoking status participants were guided through one skip pattern to one of two different sets of items for smokers and for nonsmokers. Only the measures relevant to this paper will be presented here.

Stages of effective stress management for adolescents: This algorithm asks about the consistency and efficacy of stress management and the time devoted to active stress management per day (Mauriello et al., 2002).

Perceived stress scale (PSS): The perceived stress scale is a 14 item scale designed to measure the degree to which situations in ones life are appraised as stressful. The internal consistency of the original scale is .85. The scale has been shown to correlate with smoking reduction maintenance and predict the number of smoked cigarettes. (Cohen, Kamarck, Mermelstein, 1983).

Rhode Island Stress and Coping Inventory (RISCI): The Rhode Island Stress and Coping inventory is a 10 item scale assessing physical symptoms and ways of coping with stress (Fava, Ruggiero, & Grimley, 1998).

Results

Participants

The sample for this project consisted of 673 students in the last grades of high school (15-19 years old) recruited in 11 randomly selected high schools of the two largest cities in Bulgaria (Sofia and Plovdiv). In an open-ended question on ethnicity the vast majority (96.8%) of the students identified themselves as Bulgarians. The rest pointed out various

religious and national identities. The sample was 64% female, equally distributed across the included age range, 47.8% reported a GPA equivalent to A and 41.0% were ever smokers (See Table 1.1).

Validation of RISCI

At the first step of the validation of the scale the descriptive statistics for all ten items based on the entire sample were examined. All items were retained for further analysis since no problems were identified at this stage. At the next step, principal components analysis (PCA) with varimax rotation was performed on the exploratory half of the sample. Two factors were retained in the solution, accounting for 52.6% of the variance. A two-factor solution was also supported by the Minimal Average Partial (MAP) test and corresponds to the structure of the original scale (Fava et al., 1998). The item loadings from the PCA are presented in Table 4.1. Both subscales had adequate internal consistency of $\alpha = .79$ for Coping and $\alpha = .69$ for stress.

At the next step the structure of the scale was tested in the exploratory sample through structural equation modeling (SEM). Two factor correlated and uncorrelated models were examined. Both models had an acceptable fit: χ^2 (35) = 161.25, $p < .05$, CFI = .85, RMSEA = .11 for the uncorrelated model and χ^2 (34) = 141.32, $p < .05$, CFI = .87, RMSEA = .10 for the correlated model. A chi-square difference test indicated that the correlated model fit significantly better (χ^2 (1) $_{difference}$= 19.93, $p < .05$). This model is presented in Figure 4.1.

Both models were also then tested in the confirmatory sample, where the correlation between the two factors was very low and did not significantly improve the fit of the model ($\chi^2_{uncorrelated}$ (35) = 130.83, $p < .05$, CFI = .86, RMSEA = .09; $\chi^2_{correlated}$ (34)

= 130.17, p < .05, CFI = .86, RMSEA = .09). The correlated model for the confirmatory sample is presented in Figure 4.2.

As the results from the two samples were inconclusive the two models were also examined in the combined sample. These results suggested better fit for the correlated ($\chi^2_{correlated}$ (34) = 209.19, p < .05, CFI = .88, RMSEA = .09), than for the uncorrelated model ($\chi^2_{uncorrelated}$ (35) = 222.76, p < .05, CFI = .87, RMSEA = .09). The chi-square difference test was significant (χ^2 (1) $_{difference}$= 11.57, p < .05) so the correlated model was retained and is presented in Figure 4.3.

Finally the discriminant validity of the scale was examined through the relationship with gender and age. As was expected the scales did not differ across age. Significant differences between males and females were discovered for the stress subscale (F (1, 584) = 8.67, η^2= .02) with higher stress levels reported by girls.

Validation of PSS

In the first step of the validation of the Perceived stress scale (PSS) the reversed score items from the original scale were reversed (Cohen et al., 1983). After that the analysis followed the same procedure as that described above. When the descriptive statistics were examined the item "In the last month how often have you found yourself thinking about things that you have to accomplish?" had a rather high mean value, but since it had acceptable skewness and kurtosis it was included in the PCA analysis. At the next step the same item had complex loadings and was then excluded from the scale. Originally the PSS had been developed as a unifactorial scale. The MAP procedure also suggested a single factor, but in the PCA analysis a single factor accounted for only 24.8% of the variance, while a two-factor solution accounted for 44.1%. The two factors

also made conceptual sense and were labeled "Perceived Stress" and "Perceived Coping". The PCA loadings for the two-factor solution are presented in Table 4.2. The Cronbach internal consistency coefficients for the Perceived stress and the Perceived coping scales were $\alpha = .74$ and $\alpha = .78$ respectively.

Since the MAP procedure suggested a smaller number of factors to be retained in the solution three models were tested through SEM in both the exploratory and the confirmatory samples: a one factor model, a two-factor uncorrelated model and a two factor correlated model. The one-factor model had poor fit and bad item loadings, while the two factor correlated model fit best in both samples. In these analyses, one item was excluded due to poor loadings on the perceived coping scale. The results for the three models with the final number of items are presented in Table 4.3 and the best fitting solutions for the exploratory and the confirmatory samples are presented in Figures 4.4 and 4.5 respectively.

As a final step the discriminant validity of the scales was examined through the relationship with gender and age. Once again the scales did not differ across age, but demonstrated significant differences between males and females for the stress subscale ($F(1, 584) = 28.46$, $\eta^2 = .05$) and suggested higher levels of perceived stress for girls.

Stages of effective stress management

Another stress related variable of interest included in the battery was the algorithm assessing stages of effective stress management. Two scoring algorithms were explored. In the first algorithm participants were staged solely on their answers regarding their belief that they were effectively practicing stress management (Figure 4.6). In the second algorithm two restrictions were added: participants were excluded from post-

action stages if they reported that they did not practice stress management every day and attempting regular stress management was required for inclusion in the preparation stage (Figure 4.7). As could be expected with the first algorithm more people were successfully staged (a total of 665), while with the second algorithm 630 people were staged. With the exception of the participants that could not be staged the algorithms were overlapping. The distributions across these algorithms were very similar (Table 4.4).

A valid staging algorithm for effective stress management should discriminate participants in different stages on relevant variables. In order to evaluate their sensitivity the two algorithms were compared for stage differences on stress levels, coping, level of family support for nonsmoking, GPA, demographics and number of cigarettes smoked per day for smokers. Since these variables are not part of the TTM no specific theoretical prediction exists. It could be expected however, that students who are in advanced stages of stress management would report better coping skills, lower stress levels, higher levels of family support for nonsmoking and for smokers, fewer cigarettes smoked per day.

Multivariate analysis of variance (MANOVA) was used to assess the relationship between stress and coping and the stress staging algorithms. A MANOVA conducted on the standardized T (M=50, SD = 10) scores of the RISCI revealed significant multivariate effect for both algorithms (Wilks $\Lambda = .888$, $p < .05$ and Wilks $\Lambda = .883$, $p < .05$, $\eta^2 = .06$). Follow up analysis of variance (ANOVA) indicated for both algorithms significant differences in the scales across the stages of effective stress management for the Coping scale and the Stress scale. Tukey post-hoc tests indicated that the Coping skills were significantly higher for participants in the Maintenance stage of change compared to participants in the PR group. The post-hoc tests for stress showed that people in the

Precontemplation stage reported significantly less stress than people in the other stage groups (Table 4.5).

ANOVA's were also used to compare the levels of family support for nonsmoking and the GPA's across stages. Again both algorithms produced significant effects of comparable size. Follow up Tukey tests indicated that people in Action and Maintenance for effective stress management reported higher levels of family support for nonsmoking and higher GPA's than people in precontemplation (Table 4.5). The ANOVAs for numbers of cigarettes smoked among smokers (n=274 for algorithm#1 and n=255 for algorithm#2) failed to reach significance ($F(4, 255) = 2.17$, $p<.10$, $\eta^2 = .03$ and $F(4, 239) = 2.04$, $p<.10$, $\eta^2 = .03$), but the trend was for those in earlier stages of stress management to report more cigarettes smoked in the last 24 hours. Since the effect size for this effect was of the same magnitude as the ones for GPA and family support the failure to reach significance is likely due to the limited power resulting from smaller sample sizes. The means and standard deviations of the scales by stage are presented in Table 4.5.

Discussion

The goals of this part of the study were to validate the structure of two stress and coping scales, RISCI and PSS, and to examine a TTM based stress management algorithm. The study found that both scales had good psychometric properties. The original two-factor structure of the RISCI was replicated (Fava et al., 1998). For the PSS a two-factor structure (perceived stress and perceived ability to cope) also fit the data best. This finding departs from the original unifactorial scale (Cohen et al., 1983) of perceived stress. The two derived factors were conceptually meaningful and were supported by previous reports, which had discovered and used two-factors instead of the unifactorial PSS scale (Fava et

al., 1998; Hewitt, 1992). Based on these results, it can be concluded that both measures were successfully validated with this sample of Bulgarian adolescents and can be used in future studies.

In addition to these scales, two TTM based stage algorithms for effective stress management were also assessed. The major difference between the two algorithms was in the different number of criteria required for placement in the advanced stages of stress management. With the more restrictive algorithm (number 2) a smaller number of participants could be successfully categorized in a stage. With the exception of the 35 participants that could not be staged with the second approach, the two algorithms produced 100% overlapping classification patterns.

The validity of staging algorithms within the TTM framework is usually examined through the pattern of distribution of the decisional balance and self-efficacy construct of the relevant behavior across the stages of change (Velicer et al., 1998). The TTM makes specific predictions for these stage distributions and allows formulation of theory based hypotheses. Since no decisional balance or self-efficacy stress measures were included in the current study, the relationship of the staging algorithms with relevant variables was examined instead. It can be expected that participants who are in the advanced stages of stress management would experience less stress and will report higher coping capabilities. Also students who practice effective stress management should demonstrate better school achievement and could be expected to have or perceive more supportive family environments. In addition for smokers, higher effectiveness in stress management should be correlated with lower number of smoked cigarettes.

The results of this study generally supported these expectations. Both algorithms

discriminated across all relevant variables and produced remarkably similar results and effect sizes (Table 4.5). Under these circumstances the less restrictive algorithm was preferred, since it allowed for a larger number of participants to be staged and included in further analysis and was more parsimonious. As expected students in the advanced stages of stress management had better school performance (GPA) and reported higher levels of parental support. Also consistent with expectations participants in the Maintenance stage reported the highest level of coping skills. The distribution of stress levels across the stages of change was somewhat contrary to the expected pattern with people in the Precontemplation stage of stress management reporting the lowest levels of stress. A different result was expected based on the reasoning that students who do not try to manage stress would be more vulnerable to stressful events. This would be an accurate prediction under the assumption that all participants experience certain levels of stress. The findings of this study suggest an alternative interpretation: effective stress management would reduce the levels of stress only for people who perceive that they are under stress. If this perception is absent, stress management may not lead to any changes in the levels of perceived stress and likely seems like an unnecessary behavior. This could be the profile of people in the precontemplation stage of stress management. Future work is needed to explore this possibility.

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Table 4.1. PCA item loadings for RISCI

	Loadings	
	Stress	*Coping*
I felt overwhelmed.	.641	
I felt stressed by unexpected events.	.715	
I felt I had more stress than usual.	.696	
I felt there was not enough time to complete my daily tasks.	.617	
I was pressured by others.	.649	
I was able to cope with difficult situations.		.806
I was able to cope with unexpected problems.		.789
I successfully solved problems that came up.		.789
I felt able to cope with stress.		.645
I felt able to meet demands.		.683

Table 4.2. PSS PCA loadings

Items	Loadings	
	Perceived Stress	*Perceived Coping*
In the last month how often have you…		
…been upset of something that happened unexpectedly?	.698	
…felt that you were unable to control the important things in your life?	.581	
….felt nervous and stressed?	.710	
….found that you could not cope with all the things that you had to do?	.580	
…been angered because of things that happened that were outside of your control?	.607	
…felt difficulties were piling up so high that you could not overcome them?	.685	
…dealt successfully with irritating life hassles?		.725
… felt that you were effectively coping with important changes that were occurring in your life?		.748
…felt confident about your ability to handle your personal problems?		.605
…felt that things were going your way?		.647
…been able to control irritations in your life?		.641
…felt that you were on top of things?		.778
…been able to control the way you spend your time?		.447

Table 4.3. SEM model results the PSS scale

[redacted]odel	df	Exploratory sample			Confirmatory sample		
		χ^2	*CFI*	*RMSEA*	χ^2	*CFI*	*RMSEA*
[redacted]tor (A)	54	239.26	.80	.10	420.46	.59	.15
2-factor uncorrelated (B)	54	215.42	.82	.10	148.37	.89	.07
2-factor correlated (C)	53	131.97	.91	.07	140.36	.90	.07

Chi square difference tests for the models

Difference		*Exploratory sample*		*Confirmatory sample*	
[redacted]	df	χ^2	p	χ^2	p
[redacted]	1	107.29	< .001	280.10	< .001
[redacted]	1	83.45	< .001	8.01	< .001

Table 4.4. Stages of effective stress management for two different algorithms

[redacted]	Algorithm 1 N (%)	Algorithm 2 N (%)
[redacted]ontemplation	219 (32.9)	219 (34.8)
Contemplation	37 (5.6)	37(5.9)
Preparation	53 (8.0)	45(7.1)
Action	216 (32.5)	196(31.1)
Maintenance	140 (21.1)	133(21.1)
Total staged	665	630
[redacted]tage assigned	8	43

Table 4.5. Comparisons of two stress management algorithms (Means, SD and ANOVA results)

	Stress Stage Algorithm #1			Stress Stage Algorithm #2		
	M	SD	Tukey HSD Pattern	M	SD	Tukey HSD Pattern
	F(4, 628) = 14.90*, $\eta^2 = .09$		PC < C, PR, A, M	F(4, 595) = 14.98*, $\eta^2 = .09$		PC < C, PR, A, M
Precontemplation	46.14	9.57		46.14	9.57	
Contemplation	54.62	8.91		54.62	8.91	
Preparation	53.81	8.21		53.56	8.28	
Action	51.11	9.40		51.31	9.36	
Maintenance	51.99	10.11		52.26	9.93	
Coping	F(4, 628) = 3.82*, $\eta^2 = .02$		PR < M	F(4, 595) = 3.17*, $\eta^2 = .02$		ns
Precontemplation	49.24	10.61		49.24	10.61	
Contemplation	47.51	8.16		47.51	8.16	
Preparation	46.97	10.75		48.78	9.56	
Action	50.91	9.55		51.09	9.26	
Maintenance	52.01	9.72		52.21	9.24	
Family support	F(4, 635) = 5.81*, $\eta^2 = .04$		PC < A, M	F(4, 602) = 7.23*, $\eta^2 = .054$		PC < A, M
Precontemplation	47.33	8.41		47.33	8.41	
Contemplation	50.40	9.48		50.41	9.48	
Preparation	50.43	10:08		51.62	10.20	
Action	51.64	10.99		51.60	10.80	
Maintenance	51.16	10.00		51.19	9.83	
GPA	F(4, 656) = 6.51*, $\eta^2 = .04$		PC < A, M	F(4, 621) = 7.32*, $\eta^2 = .05$		PC < A, M
Precontemplation	5.134	.853		5.13	.853	
Contemplation	5.324	.784		5.32	.784	
Preparation	5.283	.717		5.29	.695	
Action	5.353	.721		5.43	.672	
Maintenance	5.547	.662		5.55	.670	

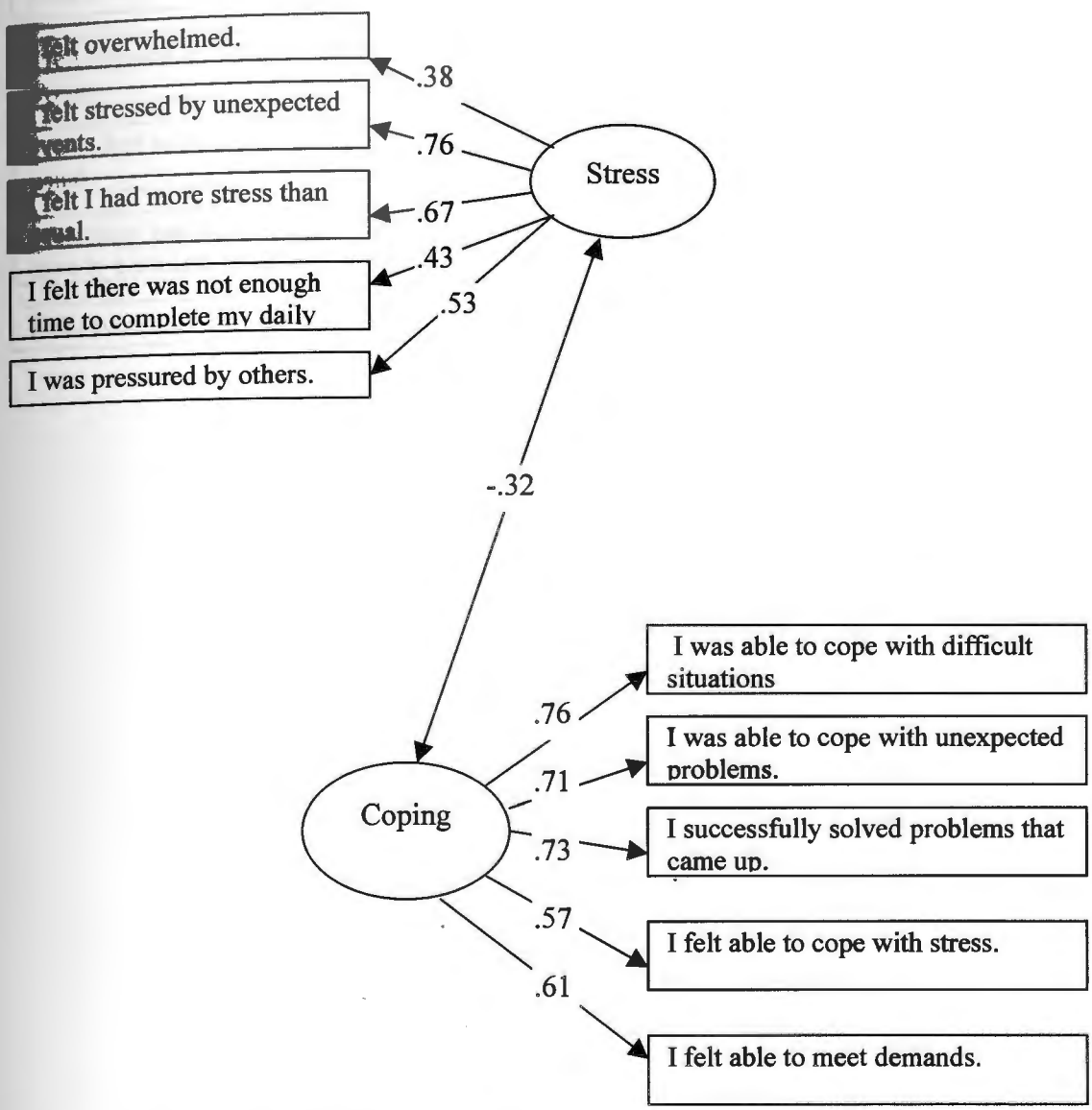

Figure 4.1. RISCI (Exploratory Sample)

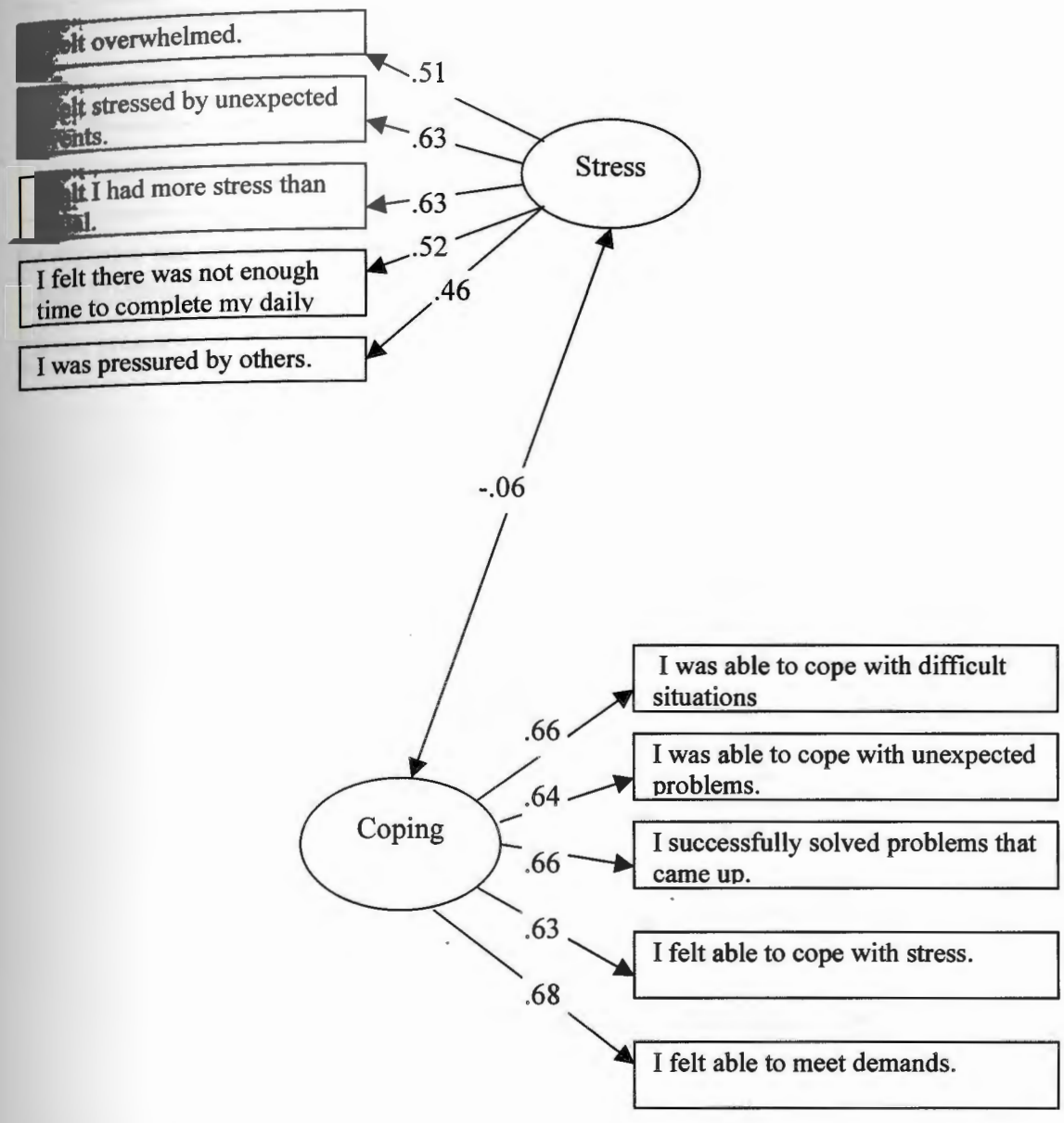

Figure 4.2. RISCI (Confirmatory Sample)

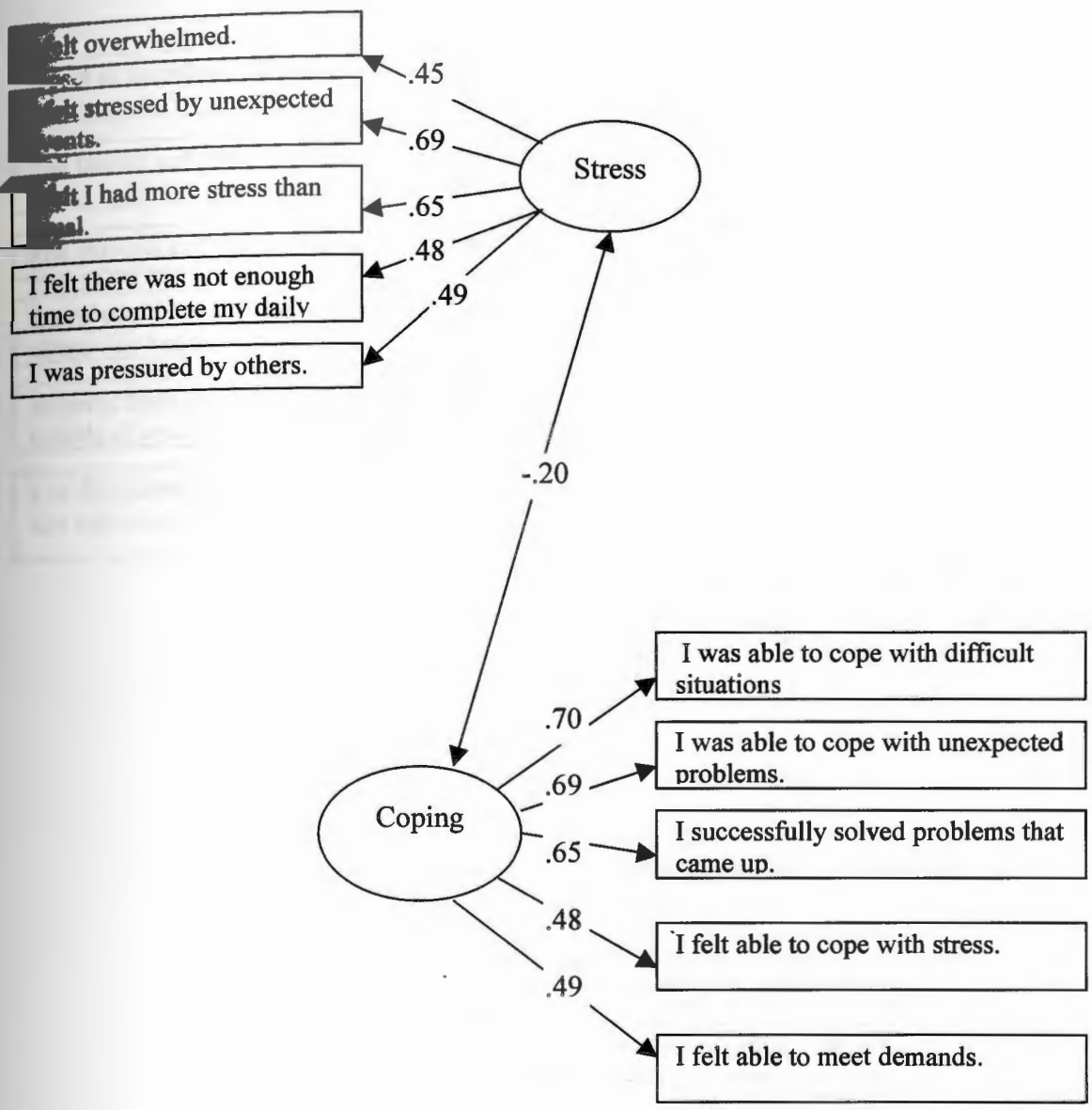

Figure 4.3. RISCI (Total Sample)

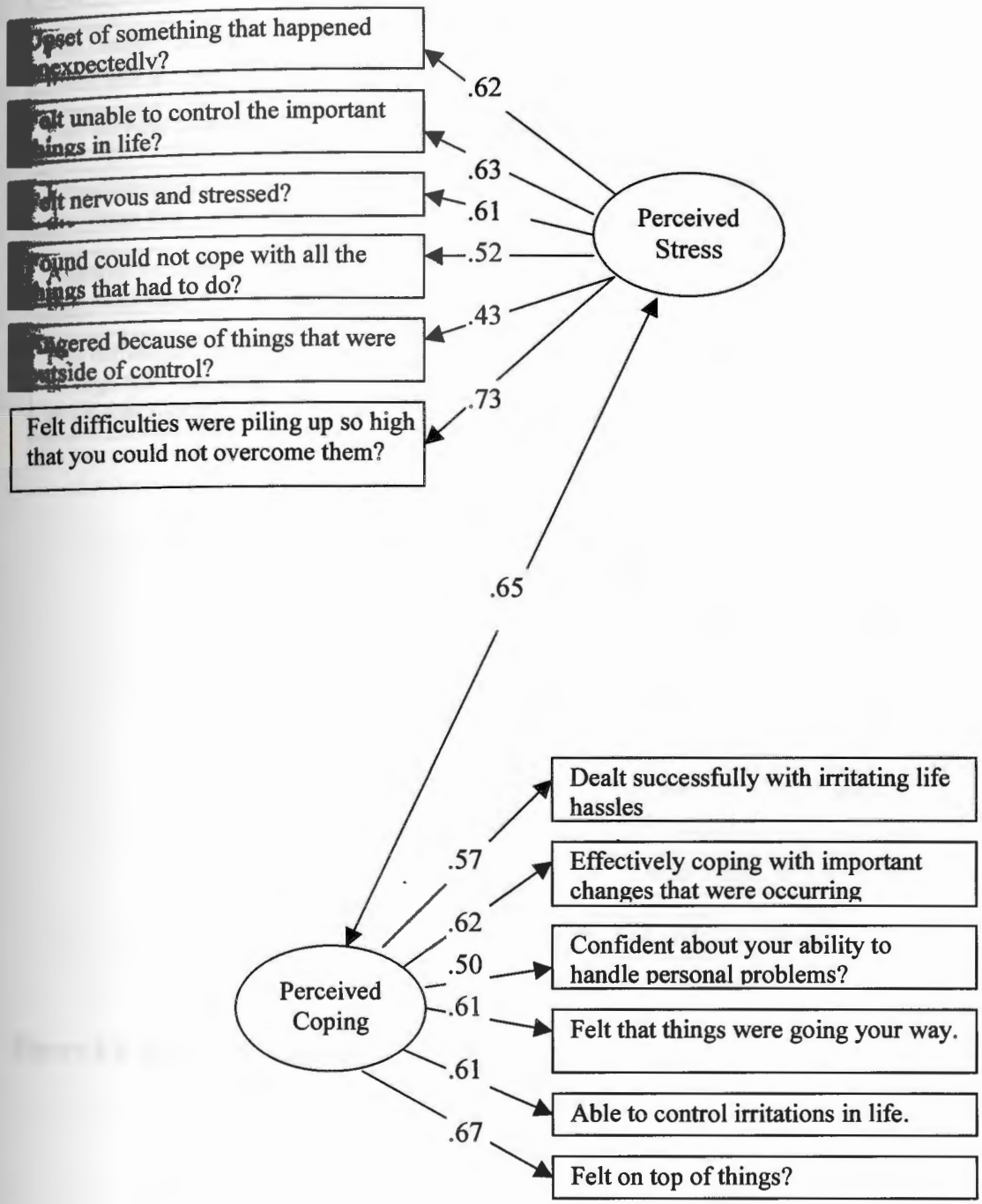

Figure 4.4. PSS (Exploratory Sample)

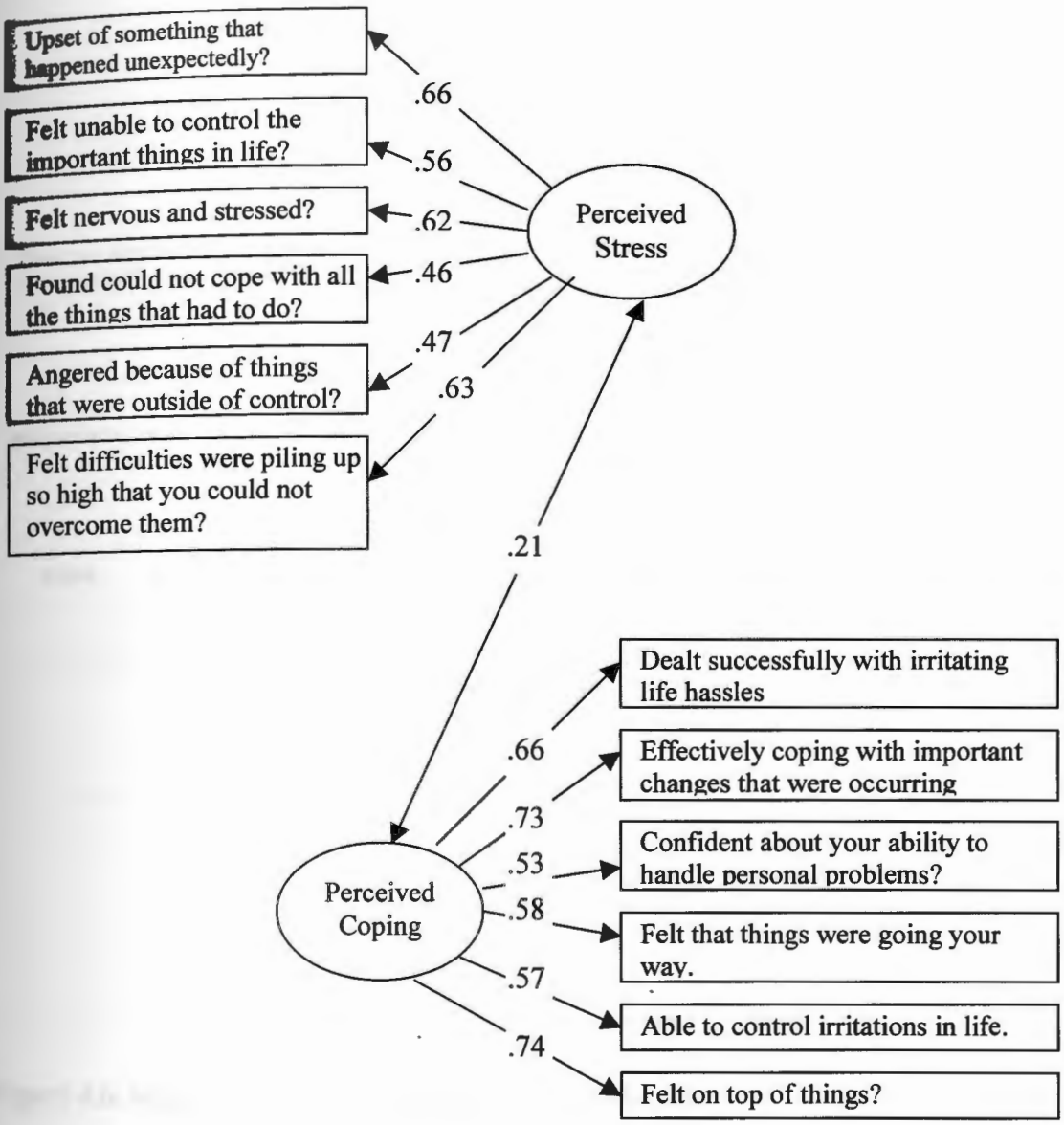

Figure 4.5. PSS (Confirmatory Sample)

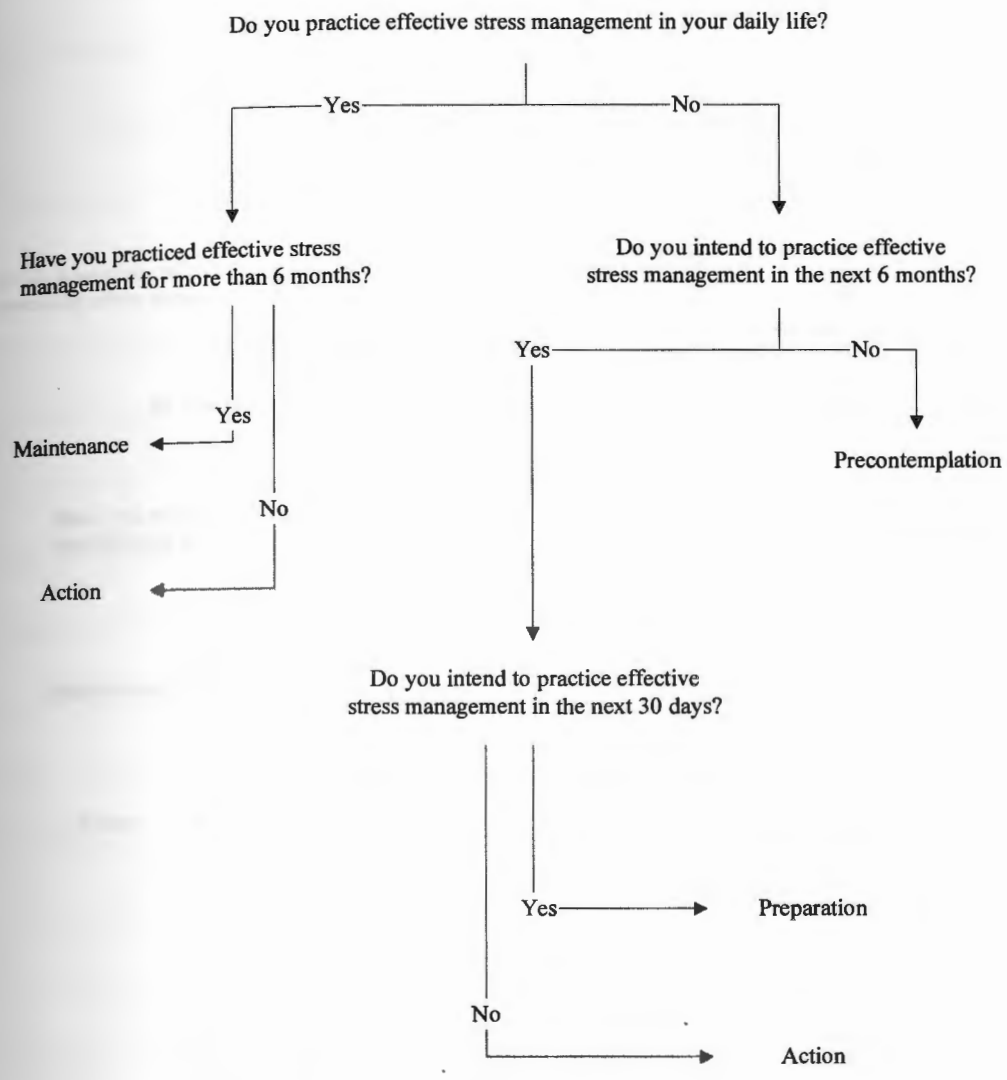

Figure 4.6. Stages for Stress management Algorithm #1

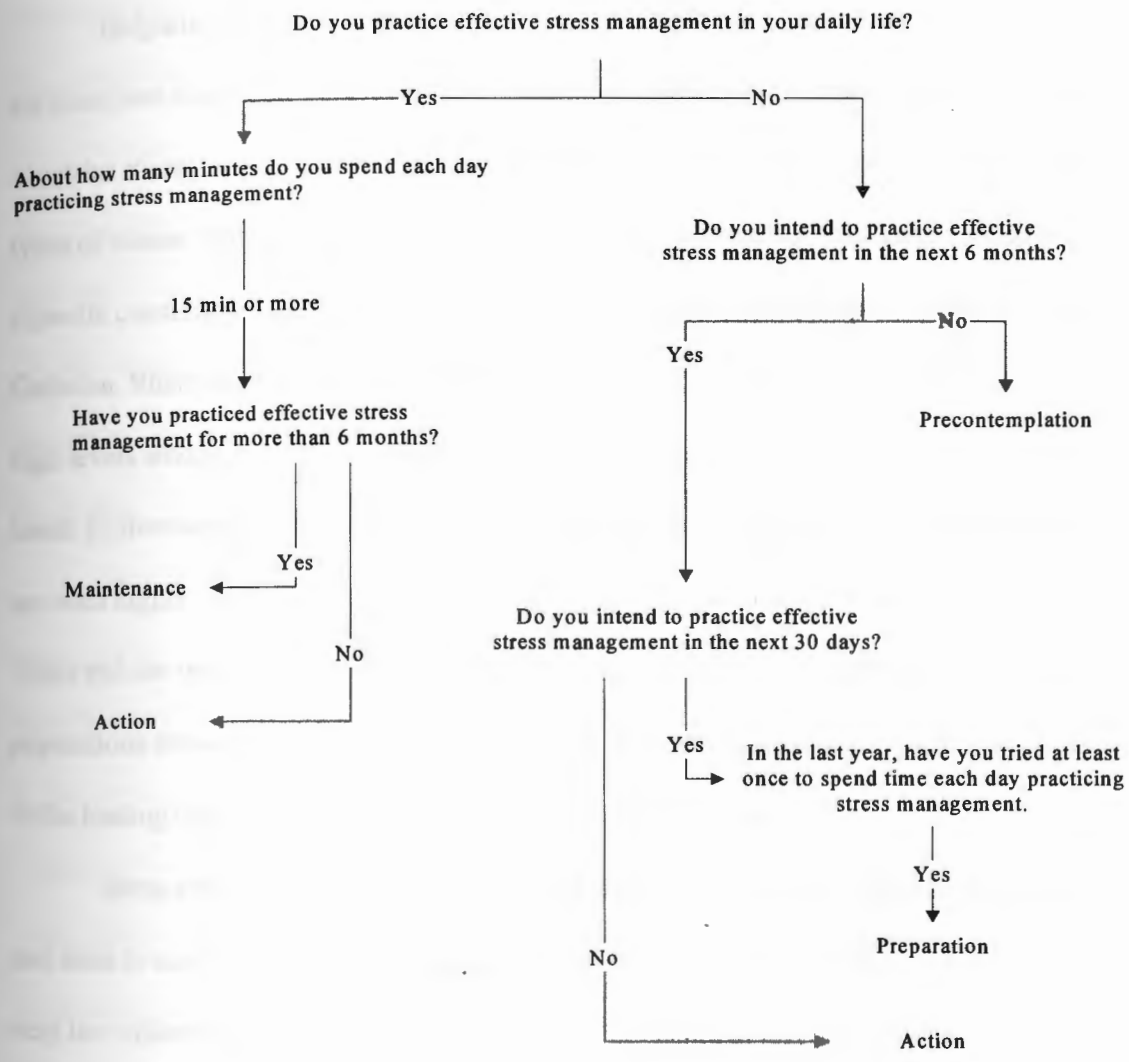

Figure 4.7. Stages for Stress management Algorithm#2

Chapter 5: Factors related to smoking status among Bulgarian adolescents

Introduction

Bulgaria is a small Eastern European country in the less developed Balkan region of the European continent. On the health maps Bulgaria has recently emerged as one of the countries characterized by strikingly high death rates due to stroke, heart disease and different types of cancer. Bulgaria has followed the pattern of deteriorating health and increase in cigarette consumption described for the countries in the Eastern European region (Corrao, Guindon, Sharma, & Shokoohi, 2000). Percentages of smokers have reached alarmingly high levels among men (49.2%), adolescents (24% for males and 31% females) and even health professionals (52.3%) (Corrao et al., 2000). According to other sources these figures are even higher, reaching 61.1% smoking prevalence in the male population (Uitenbroek, 1996) and the trend is for further increase. At the same time the mortality rate for these populations shows a steady increase over the last decade with invariably increasing numbers in the leading cause of death – cardiovascular diseases (Ginter, 1997).

Some efforts have been made to control tobacco products in Bulgaria. Advertising and sales to minors are officially banned, but the lack of appropriate enforcement leads to very low effectiveness. Smoking is prohibited in educational and health facilities, government buildings and public transportation but it is allowed and heavily practiced in all other public places (restaurants, bars, pubs, clubs), which are often visited by youth and become a powerful channel for promotional activities for the tobacco companies (World Health Organization, 1997). As a large producer of tobacco, Bulgaria maintains very low prices of domestic cigarettes ($0.40 average cost per pack), which has more than 90% of market share. This low cost facilitates easy access to tobacco products.

As a state in a transitional political and economic period, Bulgaria was unable to adequately counteract the tobacco industries and the growing health problem of smoking. Particularly weak is the support for health promotion activities, smoking prevention and educational activities (Balabanova, Bobak & McKee, 1998), although some pilot programs and prevention efforts in schools have been reported (Anguelov et al., 1999).

This context does not provide many anti-tobacco messages, placing adolescents at high risk for smoking initiation and accompanying health hazards. Although unfortunate, this situation highlights the need for research to shed light on the specific needs of this population, so that effective, low cost smoking intervention and prevention programs can be developed.

Predictors of smoking initiation and cessation

Globally, smoking is one of the leading preventable causes of premature death (WHO, 1997). Smoking initiation for adult users usually occurs during adolescent years (Fiore, 1992) and smoking is unlikely to occur if it is not started during adolescence (US Surgeon General, 1994). At the same time it is estimated that around 50% of teenage youth that initiate smoking remain addicted for 16 to 20 years (Najem, Batuman, Smith, & Feuerman, 1997). Therefore the development of quality prevention programs for teenagers is very important.

Good smoking prevention programs require better understanding of the factors that influence smoking initiation and maintenance in adolescence. This need has given a rise to a substantial body of research into the psychosocial correlates of smoking, attempting to explain the mechanisms of smoking initiation (US Surgeon General, 2000). As Pederson et al. (1998) note, there are problems in interpreting and summarizing the results of these

studies, due to differences in study designs, variety of measures and large variability of the combinations of included variables. Despite these inconsistencies there are a number of factors that emerge across a large number of the proposed models and thus allow for some more general statements (Pederson et al., 1998). Variables that have been consistently associated with smoking are stress (Koval, Pederson, Mills, McGrady, & Carvajal, 2000; SiQuira, Diab, Bodian, & Rolnitzky, 2000; Wills, 1986; Weinrich, Hardin, Valois, & Gleaton, 1996), coping strategies (Vollrath, 1998; McCubin, Needle, & Wilson, 1985; Siquierra et al., 2000), self esteem (Glendinning & Inglis, 1999; Kawabata, Shimai & Nishoka, 1998; Jackson & Henricksen, 1997), peer influence (Urberg, Cheng, & Shyu, 1991; Griesler & Kandel, 1998; Jackson, 1997), risk taking (Coogan, 1998) and family influence (Piko, 2002; Wang, Fitzhugh, Westerfield, & Eddy, 1995; Proescholdbell, Chassin, & MacKinnon, 2000). Although not so broadly studied, tobacco related marketing has also been often pointed out as a risk factor for smoking initiation (Unger, Cruz, Schuster, Flora, & Johnson, 2001) and could play an important role in a weakly regulated tobacco marketing environment.

The goal of this study was to explore the factors associated with smoking behavior in a sample of Bulgarian adolescents. A secondary goal was to assess the performance of two different analytic approaches – logistic regression and discriminant analysis.

Methods

Procedure

The sample for this project consisted of students in the last grades of high school (15-19 years old) recruited in 12 randomly selected high schools of the two largest cities in Bulgaria (Sofia and Plovdiv). The University of Rhode Island Institutional Review

Board approved all data collection protocols prior to the start of recruitment. The schools were selected to represent the major school types in the country (with general, technical and humanitarian profile). The principals of 14 schools were approached with a request for participation. Two of the schools declined due to the approaching end of the semester and in one of the schools the students had recently participated in a different study exploring risky behaviors. After permission was obtained from the principal of a school further arrangements were made with a teacher for the exact time of the data collection. The investigator administered the survey materials. All participants were presented an assent or consent form prior to their participation and were offered a small incentive for their time (a set of school aid materials). The survey materials were distributed along with a white envelope, in which participants sealed and returned their anonymous answers. None of the students declined participation and only 5 empty cards were returned.

Measures

All participants answered the full battery of measures, but only the ones used in the current analyses are presented below.

Demographic section: This section consisted of a set of questions assessing age, gender, ethnicity, grade level, type of school, level of parents education and future plans for all students. In addition items assessing the smoking status of parents and siblings, the number of close friends who smoke and the presence of rules on smoking behavior in the household were included in this section.

Perceived Stress Scale: The 14 items of the Perceived stress scale translated in Bulgarian was included in the battery (Cohen, Kamarck, Mermelstein, 1983). The scale demonstrated good psychometric properties for the population under study.

RISCI: The Rhode Island Stress and Coping inventory (Fava, Ruggiero, Grimley, 1998) translated in Bulgarian was also included. The scale had good psychometric properties for Bulgarian adolescents.

Family influences: The amount of family support for nonsmoking was assessed by this 4-item scale (Redding, Rossi, et al. 1998, 1999).

Stages of stress management for adolescents: The algorithm was used to assess the consistency and efficacy of stress management and the time devoted to active stress management per day (Mauriello et al., 2002).

Media Exposure to smoking messages and opinions about smoking: A set of independent questions assessing participants exposure to media images related to smoking (ads and anti-smoking messages) and some attitudes towards smoking were included in the battery to test their relevance for Bulgarian adolescents (questions are adopted from the WHO/CDC GYTS).

Smoking status definition question: The smoking status of participant was assessed through two items. Through the first item, participants were divided into ever smokers and never smokers. The second item provided a more precise differentiation between never smokers, experimental smokers, regular smokers and quitters.

Analytic plan

The outcome variable of interest in this study is dichotomous (case vs. noncase) with a binomial probability distribution. There are several statistical approaches to

analyzing a variable of this nature: the linear probability model, discriminant analysis and logistic regression (Cohen, Cohen, West, Aiken, 2003). In the current study two of these approaches (discriminant analysis and logistic regression) will be used and the results will be compared. Discriminant function analysis is the older of the two methods and its origins can be traced back to the works of Pearson, Mahalanobis and most notably Fisher in the second and third decade of the twentieth century. The method was specifically developed to classify observations into groups based on a set of predictors and in the first forty years of its existence it was used for this purpose (Huberty, 1994). Initial attempts to use DFA for description of group separation based on a set of variables started in the sixties and currently the procedure is used to address both types of research questions.

Logistic regression analysis is a more recent method that emerged as a result of the efforts to develop procedures that make more realistic assumptions about the data (Cohen et al. 2003). The main goal of the analysis is to find a well-fitting model that describes the relationship between an outcome and a set of predictors. Classification results can also be obtained in logistic regression but are often viewed as subordinate to the main purpose of analysis. Logistic regression can use several methods for estimation of coefficients. The maximum likelihood estimation is the method used in software packages, but an alternative method that can be used for estimation of the coefficients is the discriminant function (Hosmer & Lemeshow, 2000). When the assumptions of DFA are met logistic regression is less powerful, but since this is rarely the case logistic regression is the recommended and more widely used procedure in the analysis of dichotomous data. When the split between the groups is less than 80/20 the two methods are expected to produce similar results (Cohen et al., 2003, Press & Wilson, 1978).

Both methods will be used in the current study to identify the best fitting model for two outcome variables: smokers vs. nonsmokers and never smokers vs. ever smokers. In the following chapters the same two procedures will be used within the groups of smokers and nonsmokers. Results from both methods will be compared in terms of the relative importance of the variables selected in the models and the performance of the classification rules.

Logistic regression

Logistic regression analysis was used in order to explore and describe the relationship between the psychosocial factors of interest and the smoking status of adolescents in Bulgaria. This method has become the preferred procedure used to analyze the relationship between a dichotomous variable and one or more explanatory variables. As with any other model-building technique the goal is to find the best-fitting and parsimonious and yet plausible model accounting for the relationship between the outcome and the predictors (Hosmer & Lemeshow, 2000).

Two separate analyses were performed. In the first analysis smoking status, defined, as ever (current, former and/or experimental) vs. never smoker was used as the outcome variable. For the second logistic regression analysis never smokers and experimental smokers were combined in the group of non-smokers and the regular smokers and quitters were combined in the group of smokers.

The model building strategy outlined by Hosmer and Lemeshow (2000) was used in all analyses. Since the number of the variables of interest was rather large at the first step a selection process began though univariate analyses (chi-square and t-test) for each variable considered for inclusion in the mode. The univariate results were used to select variables for

inclusion in the multivariate model. As recommended by Hosmer and Lemeshow (2000) a rather liberal p value of .20 was used as screening criteria in order to minimize the possibility of elimination of a meaningful variable. At the next step, the importance of each variable included in the model was assessed through examination of the Wald statistic and model comparisons in which variables that do not contribute significantly to the model are eliminated. Once a satisfactory model containing the main effects was achieved, a check for potential interactions was performed. After a satisfactory model was achieved its adequacy and fit were assessed. The goodness of fit of the estimated model was evaluated through the likelihood ratio test and the Hosmer-Lemeshow test, which provides information on the effectiveness of the model in describing the outcome variable. In addition the overall and group classification rates of the fitted model and the area under the ROC curve were also examined, since they provide information on the discriminative ability of the model.

Discriminant Analysis

As an alternative approach the same two outcome variables were used in two discriminant function analyses. The method has two major applications: 1/. Group membership prediction and 2/. Group differentiation. Huberty (1994) describes these two applications as separate analyses (Predictive discriminant analysis and Descriptive discriminant analysis), but also notes that the report of results of these two applications is often mixed in the literature (Huberty & Hussein, 2003). In the current study the method will be used both to explore factors that differentiate smokers and nonsmokers and for development of classification rule and prediction of group membership. The initial steps in the analysis were similar to the ones described for the logistic regression. The same univariate test results were used to narrow down the number of variables included in the

initial model. Then, prior to analysis the data was examined for outliers and the assumptions of normality, linearity and equality of variance-covariance matrices were examined. The initial model was examined and revised several times based on the correct classification rate and the importance of included predictors assessed both through their standardized coefficients and their loadings. Both the linear combination and the classification rates of the final model were compared to the results of the logistic regression analyses.

Results

Participants

The study procedures produced a sample of 673 students in the last grades of high school (15-19 years old) recruited from 12 high schools. In an open-ended question on ethnicity the vast majority (96.8%) of the students identified themselves as Bulgarians. The rest pointed out various religious and national identities. The sample was 64% female, equally distributed across the included age range, 47.8% reported a GPA equivalent to A and 41.0% were ever smokers (see Table 1.1).

Logistic regression: Never smokers vs. ever smokers

The descriptive statistics of the variables of interest considered for inclusion in this model are presented in Table 5.1. A series of univariate tests with smoking status defined as ever vs. never smokers were performed in order to select the variables to be included in the multivariate model. The results of these tests are presented in Table 5.2. A rather liberal p value of .20 was used to select variables to be retained in the multivariate model. Based on this criterion the following variables were selected for the multivariate analysis: gender, GPA, father's education, mother's education, smoking status of siblings and parents, smoking allowed in the house, number of smoking friends, all four variables measuring

attitudes towards smoking, possession of brand logo item, stages of stress management and the stress subscale of the PSS. The correlations among these variables were examined in order to test for potential collinearity. Only the correlation between the mother's and father's education was problematically high (.701) and so the variable with the lower t-score (father's education) was excluded from the multivariate analysis.

At the next step all selected variables were included simultaneously in a multivariate logistic regression. The categorical variables were dummy coded with the following reference groups: female for gender, no smoking allowed in the house for house smoking rules, no cigarette offered by a representative, both parents non-smokers, and a belief that smoking does not have an effect on body weight. The results of the full model are presented in Table 5.3. The importance of each variable was examined through the Wald statistic and through comparisons with univariate models. Variables that did not contribute significantly to the model were excluded from the analysis and a new reduced model was fit into the data containing friends smoking status, parents' smoking status, levels of stress and the smoking attitudes variables assessing beliefs about harms of cigarettes, public policy and the connection between smoking and weight. The results of this model are presented in Table 5.4. All of the included variables were significantly related to the outcome. The coefficients from this reduced model were compared to the ones of the full model. Marked changes in coefficients are potential indicators that an important variable has been omitted. The only big change in the estimate occurred for one of the dummy variables assessing smoking status of both parents. Through additional model building it was determined that this change was due to the adjustment of this variable by home smoking status. Since the dummy variable was not a significant predictor of smoking status no additional variables were included in the model.

At the next step the possible two-way interaction effects were examined. The interactions between attitude variables and friends smoking status were tested as well as the interactions between the attitude variables themselves. The only interaction that reached significance was between the belief that it is hard to quit smoking and the belief that smoking should be banned in public places. The improvement in the fit of the model as measured by the likelihood ratio test was significant (χ^2 (1) = 11.24, $p < .05$) so the interaction term was retained. The final model is presented at Table 5.5. The model had good fit as measured by the Hosmer and Lemeshow test (χ^2 (8) = 4.89, $p > .05$) and the omnibus chi-square test (χ^2 (10) = 127.97, $p < .05$). The results of the main effects model indicate that only the belief that smoking is hard to quit and that smoking should be banned in public places had protective effects and differentiate never-smokers from ever-smokers. All other effects were in the opposite direction. The significant interaction between the two protective variables included in the final model indicated that the association between the outcome variable and the predictor depends on the level of the covariate. In this case separate odds ratios needed to be computed for the different levels of the variable and better understanding of the interaction effect was aided by examination of graphs of the relationship. The graph indicated that for people who believed smoking is hard to quit and supported bans of smoking in public places had a much higher chance of being never smokers than people who only supported public smoking bans. The odds ratio was computed for the attitudes towards bans on smoking at the lowest (1) and highest (4) level of the variable measuring the belief that smoking is hard to quit. The procedure outlined by Kleinbaum, Kupper and Morgensten (1982) was used in these computations. The estimated odds ratio for attitude of bans on smoking at various levels of belief that smoking is hard to quit was computed with the following formula:

$$\widehat{OR} = \exp\left[\hat{\beta} + \hat{\delta}(MA9)\right]$$

where $\beta = -.455$, $\delta = .398$ (see Table 5.5.) and MA9 is the level of endorsement of the item that smoking is hard to quit.

The confidence intervals around the estimated odds ratios were computed in the following manner:

$$95\%\ \text{CI} = \exp\left\{\left[\hat{\beta} + \hat{\delta}(MA9)\right] \pm 1.96\sqrt{\hat{V}ar\left[\hat{\beta} + \hat{\delta}(MA9)\right]}\right\}$$

The odds ratio at the lowest level of MA9 was .944 with 95%CI of .519 – 1.362, indicating that for participants who did not believe that smoking is hard to quit, attitudes on bans of smoking did not reliably predict smoking status. For the highest value of MA9 however the odds ratio was 3.117 with 95%CI of 2.75 to 3.50, suggesting that attitudes towards smoking is a strong predictor of smoking status for people who believe smoking is hard to quit.

The linear classification rule with equal prior probabilities was used to classify cases. The overall classification rate of the model was good (77.7%). When the group classification rates were examined, however, the hit rate for the two groups was very different. For the larger group of ever smokers 445 out of 479 (92.9%) of participants were correctly classified, while only 51 out of 159 (32.1%) of never smokers were correctly classified. It is clear that the procedure classified preferentially in the larger of the two groups (Table 5.14). These results suggest that the model has high specificity but low sensitivity. This finding can be explained with the very uneven sample sizes in the two groups and the use of equal prior probabilities. The area under the ROC curve was .702 (Figure 5.1.), which is indicative of satisfactory discrimination (Hosmer & Lemeshow, 2000).

"Smokers" vs. "Non-smokers"

The same steps used in the logistic regression exploring predictors of status as a never smokers were used with a grouping variable with two levels – smokers and nonsmokers. The never smokers and experimental smokers were combined in the group of nonsmokers and the regular smokers and the quitters were combined in the group of smokers. Based on the univariate test results the following variables were selected to be included as predictors in the initial model: age, gender, GPA, mother's education, average pocket money, sibling's and parents' smoking status, number of smoking friends, the family support for nonsmoking scale, the stress subscale of RISCI and the stress staging algorithm, as well as the items describing attitudes towards smoking and tobacco related marketing. The correlations among the selected variables were examined but no problems were discovered. The results of this model are presented in Table 5.9. The full model had a good fit as indicated by the omnibus test χ^2 (21) = 201.84, p < .05. Once again significance of the Wald test and comparisons to the univariate models were used to determine which variables could be excluded from the model without substantially decreasing its fit. Based on this criteria age, GPA, siblings' smoking status, number of smoking friends, the belief that smoking is harmful to health and should be banned in public places and the family support scale were retained. The model demonstrated good fit with and omnibus chi-square of χ^2 (8) = 210.14, p < .05 and a Hosmer and Lemeshow test of χ^2 (8) = 13.95, p > .05.The regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for all predictors are presented in Table 5.10. As can be seen from this table, all variables reliably predicted smoking status, but number of smoking friends and smoking status of siblings had the largest odds ratios and were positively associated with a status of smoker. This model was retained as the main effects

model and at the next step the two-way interaction terms were examined. Only the interaction between the number of friends who smoke and the attitudes towards smoking bans in public places produces a significant difference in the model χ^2 (1) = 7.73, $p < .05$ and was retained in the model. As in the previous logistic regression model the interaction term was plotted and separate odds ratios were computed for the lowest and highest levels of the variables measuring the number of smoking friends. The odds ratios for the influence of the attitude towards public ban of smoking for people who reported that none of their friends smokes was 1.41 with a 95% CI of .68 to 2.1, while for people who reported that almost all of their friends smoke the odds ratio was .636 (95% CI of .42 to .85). These results suggest that attitudes towards smoking bans have different directions of prediction: for people who have no smoking friends, increased belief in public bans actually increases their chances of being smokers; whereas for people with most friends who smoke, increased levels of support for public smoking bans acts instead as a protective factor.

Linear classification rule with equal prior probabilities was used to classify cases. The model had good overall classification rate of 76.8%. The classification rate for the two groups was good and better than chance with hit rates of 81.7% for nonsmokers and 70.4% for smokers suggesting both good specificity and sensitivity of the model (see Table 5.14). The area under the ROC curve (Figure 5.1) was .830 indicating excellent discrimination (Hosmer & Lemeshow, 2000).

Discriminant function analysis: Never smokers vs. ever smokers

Following the plan at the next step discriminant function analysis was performed using the same outcome variables as in the logistic regression analyses reported above. Prior to analysis all categorical variables were dummy coded. The reference group was chosen

consistently with the reference group used in the logistic regression analysis. The two groups of data were screened separately for multivariate outliers using the Mahalanobis distance procedure and two cases were excluded from further analysis. The underlying assumptions were also examined and for the continuous variables no serious violations of normality and linearity were discovered. The assumptions of equality of variance-covariance matrices was assessed through Box's M. The results indicated that significant differences exist between the variance covariance matrices. Since the test is rather sensitive and with adequate sample size the procedure is rather robust the work proceeded with DFA with ever vs. never smokers as a grouping variables and the following predictors: gender, GPA, mother's education, smoking status of siblings and parents, smoking allowed in the house, number of smoking friends, all four variables measuring attitudes towards smoking, possession of brand logo item, stages of stress management and the stress subscale of the PSS.

As the grouping variable had only two levels only one discriminant function was extracted and it was significant χ^2 (19) = 131.02, $p < .05$. Since some controversy exists on the issue of whether reporting and interpreting DFA results should be based on the standardized scores or the structure matrix loadings (Huberty, 1994; Tabachnik& Fidell, 2001), both indicators are reported and interpreted. This decision was further supported by the secondary goal to compare the results of this model with the logistic regression results. The relative importance of a variable determined by the absolute value of the standardized coefficient gives information about its contribution to the linear discrimination function. The second way to assess the relative importance of a variable is through the within-groups correlation of the variable with the canonical function. As can be seen in the results reported in Table 5.6, the number of friends who smoke and the attitudes towards smoking bans in

public places both have the largest standardized coefficients and the highest loadings in the model. These are the two variables that emerged as the strongest predictors in the logistic regression analysis as well. While the decision to retain these two variables for the final model was straightforward, the interpretation of the other variables was more challenging. Based on the structure loadings matrix no other predictors were highly correlated with the underlying latent construct. The standardized coefficients however suggested that some variables like the smoking status of the mother, belief that it is hard to quit smoking and levels of perceived stress have meaningful contributions to the linear combination. Since these variables are the same as the ones included in the logistic regression model and a secondary goal of the analysis was to compare results from both approaches two additional models were explored. One included all variables from the final logistic model and the other included only the two variables suggested by the structure matrix.

The two predictor model generated a significant discriminant function χ^2 (2) = 106.52, $p < .05$, high standardized coefficients and high structural loadings (see Table 5.7). The correct classification rate for the model, based on a linear rule with equal prior probabilities was also good with 71.5% overall rate for both original and cross-classified cases and 73.4% correct for ever smokers, 69.5% hit rate for never smokers. This hit rate is almost identical to the one generated by the full model.

The DFA model, with predictors identical to the ones selected in the final logistic regression model, also had a significant discriminant function χ^2 (10) = 133.18, $p < .05$. The standardized coefficients and structure matrix loadings are presented in Table 5.7 and indicate that many of the included variables would be candidates for exclusion based on statistical criteria. The classification rate for this model slightly outperformed the two-

predictors model for the hit rate of the larger group (74.2%) but has a poorer performance in the classification of never smokers (66.7%). The area under the ROC (see Figure 5.1) was .781 indicating good discrimination.

Discriminant function analysis: "Smokers" vs. "Non-smokers"

The same steps as outlined in the discriminant analysis for never smokers were followed. Variables were screened and selected for initial inclusion in the model based on their univariate tests (see Table 5.8). Categorical variables (gender, parents' smoking status, smoking allowed in the house, belief on relationship between smoking and weight) were dummy coded. At the next step the data set was examined for univariate and multivariate outliers. One univariate and three multivariate outliers were discovered and excluded from further analysis. No serious violations of the assumptions of normality and linearity were discovered. Box's M test produced significant results indicating that the assumption of equality of variance-covariance matrices was violated.

The discriminant function analysis included the following variables as predictors: age, gender, GPA, mother's education, average pocket money per day, smoking status of siblings and parents, smoking allowed in the house, tobacco related marketing items, beliefs that smoking, stages of effective stress management and the RISCI stress subscale.

The resulting discriminant function was significant χ^2 (22) = 205.34, $p < .05$, indicating reliable differences between smokers and nonsmokers. With a linear classification rule with equal prior probabilities the model had good overall classification rate of 78.3% and group rates of approximately the same magnitude. The standardized coefficients and structure matrix loadings presented in Table 5.12 indicates that many of the variables did not contribute to the combined linear function and the model could be substantially reduced.

Once again two different approaches were used. In the first approach, the decision to retain variables was based on their standardized coefficients. This approach led to a set of variables that were very similar to the main effects solution retained in the logistic model (age, GPA, number of smoking friends, sibling's smoking status and attitudes to bans of smoking in public places). Two variables (family support and belief that smoking is harmful to health) had lower coefficients, but not trivial coefficients and were retained in the model. This reduced model also had a significant function χ^2 (8) = 209.27, $p < .05$ and good, even though a little bit lower overall correct classification rate of 74.8% (72% for nonsmokers and 78.3% for smokers). The standardized coefficients and structure matrix loadings are presented in Table 5.13.

The second alternative approach was based on the matrix loadings of the full model and retained only variables with correlations to the function higher than .33 (Tabachnik& Fidell, 2001). There were only three variables that met those criteria: smoking bans in public places, number of smoking friends and GPA. The model produced a significant discriminant function of χ^2 (3) = 191.48, $p < .05$. The classification rate was still good (73.7%), although the classification rate for smokers was lower (71.9%). The results for the individual variables are presented in Table 5.13.

Discussion

Factors related to smoking status

This study supports the importance of factors traditionally associated with smoking, such as peer and family influence and attitudes towards public tobacco policies. Peer influence emerged as the strongest factor in this sample related to both smoking initiation and progression to regular smoking. Due to the cross-sectional nature of the study it is impossible

to infer causality and it is hard to determine whether friends who smoke put the individual at a greater risk, or smokers just tend to befriend other smokers. The evidence supports the idea that modeling, peer pressure or selective association (Urberg et al., 1991) are at work, but future work with more elaborate longitudinal designs is needed to select the right factor or combination of factors at work.

Another factor that was a strong predictor and common across both models was attitude towards smoking bans in public places. This variable was included in interactions in both models. When the outcome of interest was never smoker, the interaction was with the belief that smoking is hard to quit. Students who believed that smoking is hard to quit and supported public bans were three times more likely to be nonsmokers. This result suggests that prevention interventions could use messages explaining the difficulties of quitting a smoking addiction. When the outcome was regular smoking, the interaction was with the number of smoking friends. While once again the evidence for a strong relationship is clear, causality between attitudes towards smoking bans cannot be inferred due to the cross-sectional design of this study. The results indicate however that development and implementation of a better measure assessing attitudes towards smoking bans (e.g., Laforge, Velicer et al., 1998) would be worthwhile in future work.

The models revealed some variation in the factors that play a role in the decision to try smoking and the ones that contribute to turning smoking into a habit. For instance while the smoking of the parents (and more specifically the mother) emerged as an important factor in the decision to initiate smoking, the progression to regular smoking is related to the smoking status of the siblings, but not the parents. The smoking status of the mother is a predictor in which causality can be inferred, but since it is not a variable that can be easily

manipulated no implications for further interventions can be made. The variable measuring family support was also related to regular smoking, the direction of this relation, however, was opposite to that expected: students who reported higher scores on the measure were actually more likely to be smokers. Although the effect was small (3%), this result suggests that home discussions of smoking do not necessarily promote smoke-free choices in this population, and may be even occur only as a consequence of perceived problems with smoking on the side of the parents. In fact, such support for nonsmoking may actually produce reactance, increasing the likelihood of smoking in Bulgarian youth. Actual behavior, rather than smoking discussions seem to be a deterrent to smoking initiation.

The most unexpected finding of the study was that stress and coping were not factors associated with smoking behavior and thus no evidence was present to support hypothesis #4. The failure to discover any relationship between stress and smoking may be due to a number of factors. For instance the relationship may be more complex and while not associated with smoking initiation or progression to regular smoking, stress and coping could predict easier cessation for smokers with lower levels of stress and better coping skills. This possibility will be explored in Chapter 6. Another alternative is that the selected stress and coping measures, although good in a psychometric sense, were not the best operationalization of the constructs for the question under study. Stressful life could be a better predictor of smoking initiation, for example. Finally it is possible that some cultural variations exist. Since a large body of literature supports the existence of a relationship between smoking, coping and stress, further research is needed with this specific population to better understand findings here.

Comparison of the results of Logistic Regression and Discriminant Function Analysis

A secondary goal of these analyses was to compare the results of two approaches to

analyzing data with binary outcome and a mix of both categorical and continuous predictor variables. The methods of choice were discriminant function analysis and logistic regression. A number of theoretical comparisons of the methods have been published (Efron, 1975; Press & Wilson, 1978; Hosmer, Hosmer & Fisher, 1983), but applied studies using and comparing the methods are rare (Manel, Dias, & Ormerod, 1999). Most of the previous work focuses on comparison of performance of the classification rules of the two methods and in general the conclusion is that for models that contain both categorical and continuous variables logistic regression is preferred (Press &Wilson, 1978). Simulation studies have also suggested that discriminant function estimation creates bias in the estimates for categorical variables (Hosmer, Hosmer & Fisher, 1983). These recommendations are usually supported by the fact that DFA works under assumptions that are rarely present in real life data, but on the other hand it has been suggested that the method is rather robust to violations of these assumptions (Knoke, 1982).

In this study two different models assessing the relationship of a number of factors with smoking status were compared. The first model defined nonsmokers as people who have never tried smoking and resulted in an uneven split in the outcome variable (25% never smokers). In the second model the nonsmokers were defined as people who do not smoke regularly (including ex-smokers) and the resulting split was more balanced (55% nonsmokers).

The function coefficients of the DFA were somewhat lower than the function coefficients provided by linear regression, but the relative magnitude of the coefficient was the same across the two approaches. This means that if function coefficients are of interest and are used for final selection of the model, the same predictors would be included. If the

underlying latent construct in DFA is of interest, the correlations of the predictors with the linear function need to be examined. Using these matrix loadings only the strongest predictors could be identified in the current study. Since matrix loadings are not usually used for variable selection/deletion this observation is not of great concern.

The overall classification rate for both methods as illustrated in Table 5.14 across all methods was good and almost identical, with slightly higher rates for the logistic regression models. When the group-hit rates were examined, however, some differences appeared in the model with a more extreme split in the groups sizes. In this case, the logistic regression model had a very high specificity, but the sensitivity was very low. This pattern was much weaker in the model with a more equal group size split. All classification rules were built with equal prior probabilities, since no better estimate was available for the population sizes. Since prior probabilities and the resulting classification cutoff point play an important role in the classification results, the specificity and sensitivity for all models and methods were plotted across all possible cutoff points (Figures 5.2, 5.3, 5.5 and 5.6). As can be seen from the graphs, the optimal cutoff point for the logistic regression model is strongly influenced by the group sample sizes, while the optimal cutoff point for discriminant function analysis is more stable and closer to the midpoint under both conditions. These results indicate that when the group sample sizes are markedly unequal and no information is available to justify adjustment of prior probabilities, the sensitivity of the logistic regression model will suffer and underperform compared to the DFA model.

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Table 5.1. Descriptive statistics of variables included in the ever vs. never smoker analysis

[redacted]	N	Mean	SD	Min.	Max.
[redacted]	670	16.52	1.12	14	19
Gender (F =1)	671	.65	.478	0	1
GPA	667	5.31	.769	2	6
Plans for the future	666	1.94	1.354	1	5
Father's education	667	2.44	1.542	1	6
Mother's education	666	2.24	1.434	1	6
Average pocket money a day	638	3.23	2.149	0	15
Siblings' smoking status	667	2.34	.766	1	3
How many close friends smoke	671	3.27	.895	1	4
Parents' smoking status	670	2.54	1.226	1	4
Smoking allowed in the house	670	.61	.489	0	1
Staging Stress	664	3.03	1.595	1	5
RISCI Coping scale	650	49.98	9.998	18.75	71.56
RISCI Stress scale	651	49.98	10.00	24.04	72.39
Family influence	644	50.01	10.00	39.64	80.34
MA1 # Media antismoking messages	668	3.72	1.092	1	5
MA2 # Antismoking ads at events	667	4.08	.934	1	5
MA3 Cigarette ads in media	668	3.09	1.288	1	5
MA4 Cigarette ads at events	666	3.06	1.291	1	5
MA5 Possession cigarette brand logo item	667	4.40	.870	1	5
MA6 Representative offered free cigarette	668	.12	.330	0	1
MA7 Smoking and weight	665	2.23	.957	1	3
MA8 Smoking harmful to health	666	3.78	.493	1	4
MA9 Hard to quit smoking	666	2.80	.958	1	4
MA10 Banning smoking in public places	665	2.66	1.05	1	4
PSS Total	629	50.01	10.00	24.53	84.79
Smoking status	644	.427	.495	0	1
[redacted] istwise)	520				

Table 5.2. Univariate tests results for the LR on never smokers

	t	X^2(df)	*Univariate p*
	.887		>.20
Gender (F =1)		**5.72(1)**	**< .05**
GPA	**-3.75**		**<. 001**
Plans for the future	.123		>.20
Father's education	**1.45**		**< .20**
Mother's education	**2.01**		**< .20**
Average pocket money a day	**.803**		>.20
Siblings' smoking status		**18.49 (2)**	**<. 001**
How many close friends smoke	**8.93**		**<. 001**
Parents' smoking status		**14.03 (3)**	**<.05**
Smoking allowed in the house		**17.25 (2)**	**<.001**
Family influence	1.021		>.20
# Media antismoking messages	.100		>.20
# Antismoking ads at events	-.420		>.20
# Cigarette ads in media	1.409		>.20
# Cigarette ads at events	-.858		>.20
Possession cigarette brand logo item	**-2.810**		**< .05**
Representative offered free cigarette		**8.42(1)**	**< .05**
Smoking and weight		**11.43 (2)**	**< .05**
Smoking harmful to health	**-2.652**		**< .05**
Hard to quit smoking	**-2.464**		**< .01**
Banning smoking in public places	**-8.203**		**<. 001**
Staging Stress	**-2.54**		**< .20**
RISCI Coping scale	.037		>.20
RISCI Stress scale			>.20
PSS Total	**.989**		>.20
PSS Coping	**.333**		>.20
PSS Stress	**1.99**		**<. 05**

Note: Bolded variables attained significance.

Table 5.3. Logistic regression results ever vs. never smokers: Full model

	B	S.E.	Wald	df	p	OR	95.0% C.I.for OR	
							Lower	Upper
[redacted]	.286	.234	1.491	1	.222	1.33	.84	2.11
GPA	.210	.169	1.534	1	.215	1.23	.89	1.72
Mother's education	-.053	.082	.421	1	.516	.95	.81	1.11
SIBL_SM			3.153	2	.207			
SIBL_SM(1)	.150	.285	.277	1	.599	1.16	.66	2.03
SIBL_SM(2)	-.412	.274	2.252	1	.133	.66	.39	1.13
# of close friends who smoke	**-.514**	**.123**	**17.602**	**1**	**.001**	**.60**	**.47**	**.76**
Parents' smoking								
No (Reference)			5.881	3	.118			
Only father	-.341	.330	1.064	1	.302	.71	.37	1.36
Only mother	**-.707**	**.359**	**3.879**	**1**	**.049**	**.49**	**.24**	**.99**
Both	.026	.337	.006	1	.938	1.03	.53	1.99
Smoking allowed at home(1)	-.239	.288	.691	1	.406	.79	.45	1.38
Possession cigarette brand logo item	.109	.140	.613	1	.434	1.12	.85	1.47
MA6(1)	-.421	.385	1.195	1	.274	.66	.31	1.40
MA7			**4.958**	**2**	**.084**			
MA7(1)	**-.526**	**.237**	**4.934**	**1**	**.026**	**.59**	**.37**	**.94**
MA7(2)	**-.265**	**.627**	**.179**	**1**	**.672**	**.77**	**.22**	**2.62**
Smoking harmful to health	.104	.268	.152	1	.697	1.11	.66	1.88
Hard to quit smoking	**.213**	**.117**	**3.287**	**1**	**.070**	**1.24**	**.98**	**1.56**
Banning smoking in public places	**.479**	**.119**	**16.272**	**1**	**.001**	**1.62**	**1.28**	**2.04**
PSS Stress	**-.019**	**.011**	**2.957**	**1**	**.086**	**.98**	**.96**	**1.00**
Stage Stress	.065	.070	.855	1	.355	1.07	.93	1.22
Constant	-2.132	1.619	1.733	1	.188	.12		

Table 5.4. Logistic Regression (never smokers): Main effects model

	B	S.E.	Wald	df	p	OR	95.0% C.I.for OR	
							Lower	Upper
[redacted]friends who smoke	-.613	.113	29.216	1	.001	.54	.43	.68
Parents' smoking								
No (Ref)			5.623	3	.131			
Only father	-.380	.289	1.728	1	.189	.68	.39	1.21
Only mother	-.725	.318	5.211	1	.022	.48	.26	.90
Both	-.243	.253	.928	1	.335	.78	.48	1.29
Smoking and weight								
No difference (Ref)			5.045	2	.080			
Loose lb	-.491	.223	4.832	1	.028	.61	.40	.95
Gain lb	-.437	.607	.519	1	.471	.65	.20	2.12
Hard to quit smoking	.228	.112	4.167	1	.041	1.26	1.01	1.56
Banning smoking in public places	.572	.111	26.683	1	.001	1.77	1.43	2.20
PSS Stress	-.019	.010	3.497	1	.061	.98	.96	1.00
Constant	-.057	.747	.006	1	.939	.94		

Table 5.5. Logistic regression (never smokers): Final model

	B	S.E.	Wald	df	p	OR	95.0% C.I.for OR	
							Lower	Upper
[redacted] friends who smoke	-.634	.116	29.85	1	.001	.53	.42	.67
Parents' smoking			5.226	3	.156			
No (Reference)								
Only father	-.401	.295	1.852	1	.174	.67	.38	1.19
Only mother	-.692	.321	4.659	1	.031	.50	.27	.94
Both	-.217	.255	.722	1	.395	.80	.49	1.33
Smoking and weight								
No difference (Ref)			4.983	2	.083			
Loose lb	-.487	.226	4.643	1	.031	.61	.39	.96
Gain lb	-.508	.601	.716	1	.397	.60	.19	1.95
Hard to quit smoking	-.864	.337	6.580	1	.010	.42	.22	.82
Banning smoking in public places	-.455	.315	2.087	1	.149	.64	.34	1.18
Hard to quit X Ban	.368	.109	11.37	1	.001			
PSS Stress	-.019	.011	3.164	1	.075	.98	.96	1.00
Constant	2.978	1.133	6.909	1	.009	19.65		

Table 5.6. Standardized coefficients and matrix loadings for the full DFA ever vs. never smokers

[redacted]	Standardized coefficients	Matrix loadings
[redacted]	.157	.251
GPA	-.094	-.341
Mothers education	.083	.200
How many close friends smoke	.499	.731
Stages Stress	-.120	-.196
PSS Stress	.169	.172
Siblings smoke	-.058	-.098
No siblings	.143	.334
Father smokes	.096	.041
Mother smokes	.205	.200
Both parents smoke	-.034	.093
Smoking helps loose lb.	.159	.254
Smoking leads to lb. gain	.046	.042
Cigarette brand logo item	-.071	-.203
Representative offered free cigarette	-.121	-.212
Smoking harmful to health	-.019	-.195
Hard to quit smoking	-.184	-.175
Ban smoking in public places	-.392	-.613
[redacted] allowed in the house	-.120	-.356

Table 5.7. Standardized coefficients and matrix loadings DFA ever vs. never smokers: final models

	Standardized coefficients	Matrix loadings
How many close friends smoke	.586	.735
Hard quit X Ban	-1.291	-.644
Banning smoking in public places	.441	-.634
Smoking helps loose lb.	.192	.249
Mother smokes	.229	.190
Hard to quit smoking	.623	-.183
PSS Stress	.143	.163
Both parents smoke	.085	.101
Smoking leads to lb. gain	.093	.051
Father smokes	.122	.019

Table 5.8. Univariate tests results for the LR on smokers

	t (df)	X^2(df)	Univariate p
			< .05
Gender (F =1)		**4.07(1)**	**< .05**
GPA	**6.75 (638)**		**< .001**
PLANS for the future	-.378 (637)		> .200
Father's education	-1.03 (639)		> .200
Mother's education	**-2.19 (638)**		**< .05**
Average pocket money a day	**-2.28 (614)**		**< .05**
Siblings' smoking status			**< .001**
How many close friends smoke	**-11.56 (642)**		**< .001**
Parents' smoking status			**< .001**
Smoking allowed in the house		**18.03 (1)**	**< .001**
Family influence	1.78 (619)		**< .100**
Antismoking messages	.208 (642)		> .200
Antismoking events	.545 (641)		> .200
Cigarette ads in media	-1.50 (642)		**< .100**
Cigarette ads events	-.65 (642)		> .200
Cigarette brand logo item		**17.27 (1)**	**< .001**
Representative offered free cigarette		**11.98 (1)**	**< .001**
Smoking and weight	**2.96 (640)**		**< .05**
Smoking harmful to health	**4.50 (640)**		**< .001**
Hard to quit smoking	**.592 (640)**		> .200
Banning smoking in public places	**11.26 (640)**		**< .001**
PSS Total	-.479 (604)		> .200
PSS Coping	-.489 (621)		> .200
PSS Stress	1.30 (625)		> .200
Staging Stress	**1.52 (637)**		**< .200**
RISCI Coping scale	-.389 (625)		> .200
[redacted] **Stress scale**	**1.30 (625)**		**< .200**

[redacted] Note: Bolded values attained significance at the indicated levels.

Table 5.9. Logistic regression results smokers vs. nonsmokers: Full model

	B	S.E.	Wald	df	p	OR	95.0% C.I.for OR	
							Lower	Upper
Age	**.275**	**.099**	**7.651**	**1**	**.006**	**1.32**	**1.08**	**1.59**
Gender	-.229	.241	.904	1	.342	.80	.50	1.28
GPA	**-.492**	**.159**	**9.650**	**1**	**.002**	**.61**	**.45**	**.83**
Mother's education	.047	.079	.359	1	.549	1.05	.90	1.23
Pocket money	-.006	.053	.013	1	.909	.99	.89	1.10
Siblings' smoking								
No (Reference)			7.381	2	.025			
Don't have	.118	.294	.162	1	.687	1.13	.63	2.01
Yes	**.634**	**.238**	**7.088**	**1**	**.008**	**1.89**	**1.18**	**3.01**
Number of smoking friends	**.683**	**.152**	**20.268**	**1**	**.000**	**1.98**	**1.47**	**2.67**
Parents' smoking								
No (Reference)			2.433	3	.487			
Only father	.000	.344	.000	1	1.000	1.00	.51	1.96
Only mother	.214	.336	.406	1	.524	1.24	.64	2.39
Both	.422	.333	1.601	1	.206	1.52	.79	2.93
Smoking allowed in house	-.433	.281	2.386	1	.122	.65	.37	1.12
Cigarette brand logo item	-.202	.127	2.524	1	.112	.82	.64	1.05
MA6(1)	.325	.311	1.094	1	.296	1.38	.75	2.55
Smoking and weight								
No difference (Ref)			1.473	2	.479			
Loose lb	.269	.222	1.472	1	.225	1.31	.85	2.02
Gain lb	.132	.600	.049	1	.826	1.14	.35	3.7
Smoking is harmful	**-.467**	**.232**	**4.037**	**1**	**.045**	**.63**	**.40**	**.99**
Ban on smoking	**-.724**	**.113**	**40.844**	**1**	**.000**	**.49**	**.39**	**.61**
Stages stress	.064	.073	.772	1	.380	1.07	.92	1.23
RISCI Stress	-.004	.011	.096	1	.757	.99	.97	1.02
Family support	**.021**	**.011**	**3.484**	**1**	**.062**	**1.02**	**.99**	**1.04**
Constant	-1.326	2.355	.317	1	.573	.27		

Note: Bolded values indicate significance.

Table 5.10. Logistic regression results smokers vs. nonsmokers: Main effects model

	B	S.E.	Wald	df	p	OR	95.0% C.I. for OR	
							Lower	Upper
	.249	.090	7.740	1	.005	1.28	1.08	1.53
GPA	-.381	.136	7.831	1	.005	.68	.52	.89
Siblings' smoking			7.300	2	.026			
No (Reference)								
Don't have	.241	.269	.803	1	.370	1.27	.75	2.16
Yes	.600	.222	7.300	1	.007	1.82	1.18	2.81
# of close friends who smoke	.851	.139	37.728	1	.000	2.34	1.79	3.07
Smoking harmful to health	-.419	.213	3.856	1	.050	.66	.43	.99
Ban on smoking	-.669	.104	41.162	1	.000	.51	.42	.63
Family influence	.028	.010	7.335	1	.007	1.03	1.01	1.05
Constant	-3.566	1.988	3.215	1	.073	.03		

Table 5.11. Logistic regression results smokers vs. nonsmokers: Final model

	B	S.E.	Wald	df	p	OR	95.0% C.I. OR	
							Lower	Upper
	.248	**.090**	**7.523**	**1**	**.006**	**1.28**	**1.07**	**1.53**
GPA	**-.360**	**.137**	**6.948**	**1**	**.008**	**.70**	**.53**	**.91**
Siblings' smoking			7.079	2	.029			
No (Ref)								
Don't have	.204	.272	.561	1	.454	1.23	.719	2.09
Yes	**.597**	**.225**	**7.059**	**1**	**.008**	**1.82**	**1.17**	**2.82**
# of close friends who smoke	**2.007**	**.449**	**19.944**	**1**	**.000**	**7.44**	**3.08**	**17.95**
Smoking harmful to health	**-.438**	**.214**	**4.202**	**1**	**.040**	**.65**	**.43**	**.98**
Ban smoking	**.745**	**.514**	**2.104**	**1**	**.147**	**2.11**	**.77**	**5.77**
Family support	**.030**	**.010**	**8.659**	**1**	**.003**	**1.03**	**1.01**	**1.05**
Friends x Bans	**-.399**	**.143**	**7.796**	**1**	**.005**			
Constant	-7.836	2.551	9.436	1	.002	.00		

[redacted]: Bolded values indicate significance.

Table 5.12. Standardized coefficients and matrix loadings for the full DFA smokers vs. nonsmokers

	Matrix loadings	Standardized coefficients
[redacted]oking in public places	**-.686**	**-.556**
How many close friends smoke	**.626**	**.391**
GPA	**-.402**	**-228**
Siblings smoke	.334	**.215**
Smoking harmful to health	-.277	-.160
Smoking allowed in the house	.229	-.118
Possession of cigarette brand logo item	-.222	-.150
Age	.202	**.211**
[redacted]epresentative offered free cigarette	.194	.109
Both parents smoke	.189	.148
Average pocket money a day	.165	.006
Number of cigarette ads in media	.164	.169
Smoking helps loose lb	.151	.087
Mother's education	.134	.056
Staging Stress	-.132	.052
Gender	.110	**.211**
Family support	.090	.154
RISCI stress	-.069	-.013
Father smokes	-.065	.002
Mother smokes	.054	.080
No siblings	-.048	.021
Smoking leads to lb gain	-.003	.007

Table 5.13. Standardized coefficients and matrix loadings for the final DFA smokers vs. nonsmokers

Model based on standardized coefficients	Matrix loadings	Standardized coefficients
[redacted]y close friends smoke	.731	.550
Ban of smoking in public places	-.713	-.550
GPA	-.421	-.227
Age	.173	.182
Siblings smoke	.336	.242
No siblings	-.043	-.056
Model based on structure matrix		
[redacted]ny close friends smoke	-.766	-.599
Ban of smoking in public places	.744	.569
GPA	.439	.268

Table 5.14. Classification rates comparisons

Model		Logistic regression			Discriminant function analysis		
		Observed		Overall classification	Observed		Overall classification
	Predicted	0	1	rate	0	1	rate
Ever vs. never smoker	Ever (0)	445	108		356	56	
	Never (1)	34	51	77.7%	124	106	72.3%
	Total	479	159		480	162	
Group classification		*92.2*	*32.1%*		*74.2%*	*66.7%*	
Smokers vs. nonsmokers	Nonsmoker (0)	281	79		247	58	
	Smoker (1)	63	188	76.8%	96	209	74.8%
	Total	344	267		343	267	
Group classification		*81.7%*	*70.4%*		*72.0%*	*78.3%*	

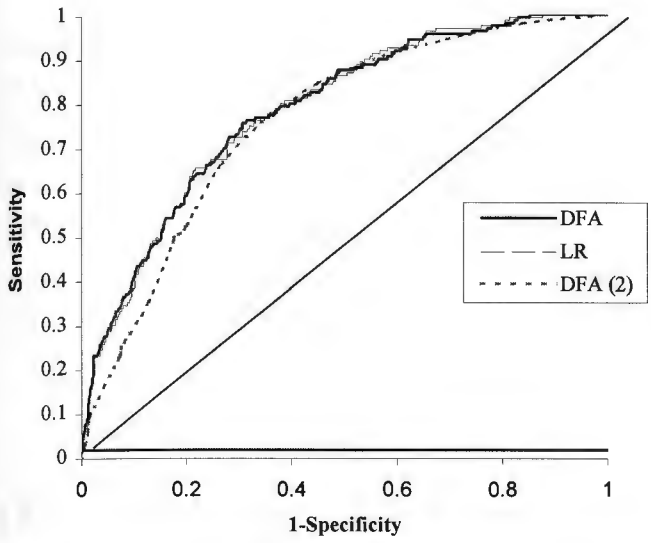

Figure 5.1. ROC's for the models on never smokers

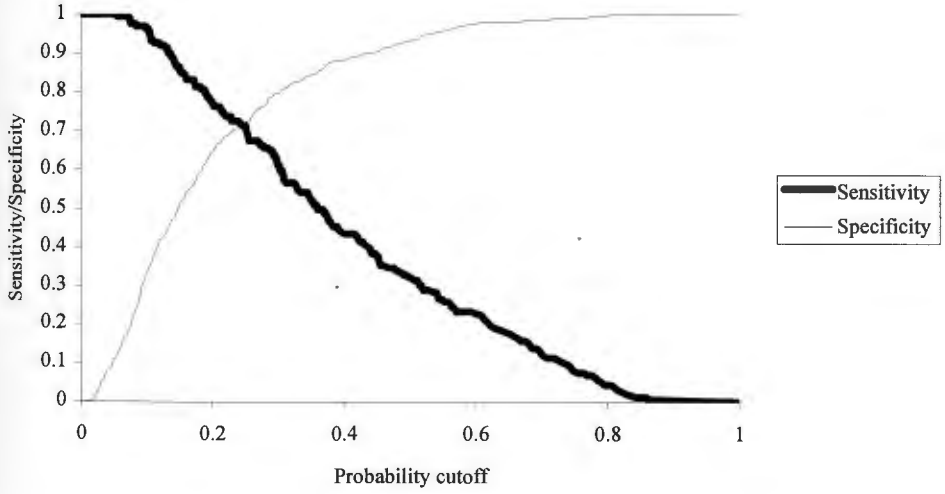

Figure 5.2. Sensitivity and specificity across probability cutoff points for the logistic regression model on never smokers

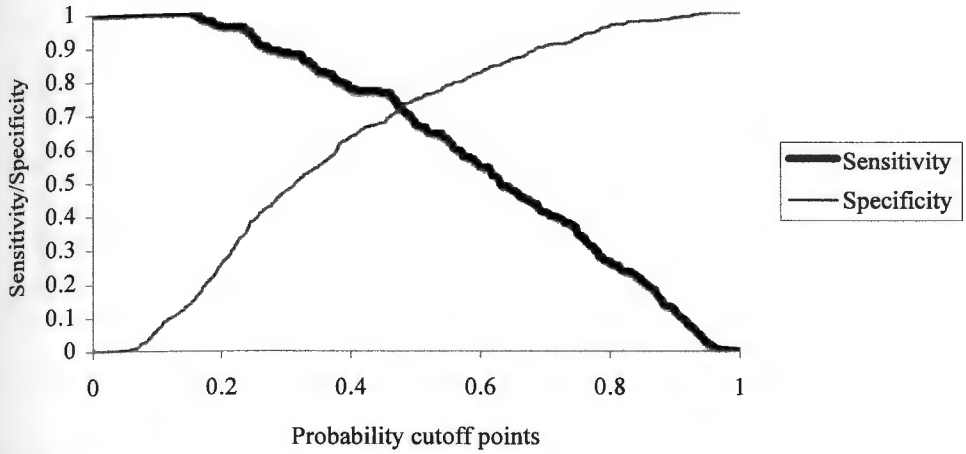

Figure 5.3. Sensitivity and specificity across probability cutoff points for the DFA model on never smokers

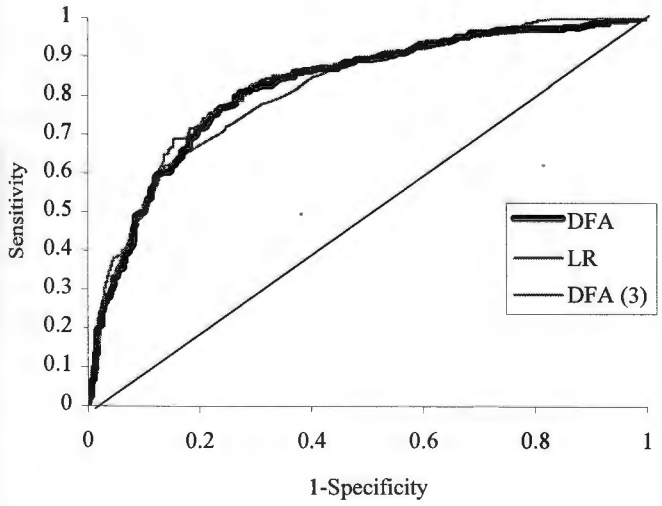

Figure 5.4. ROC's for the models on smokers

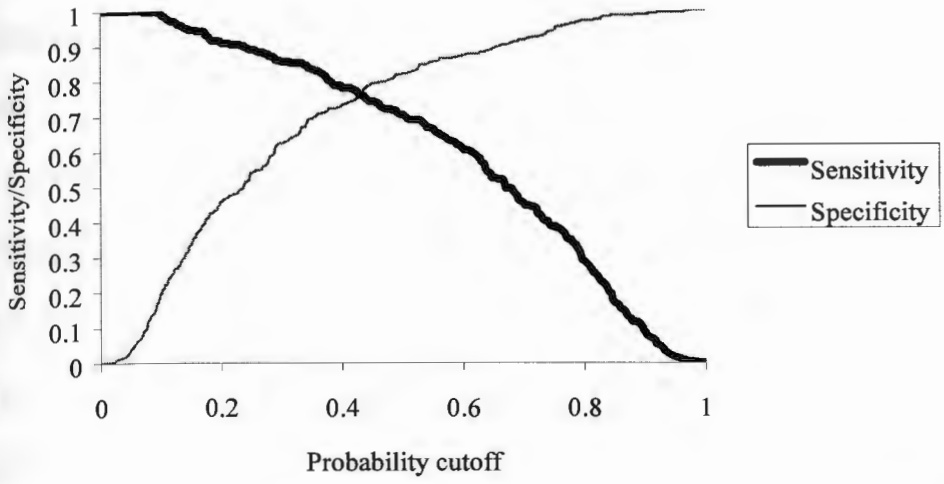

Figure 5.5. Sensitivity and specificity across probability cutoff points for the logistic regression model on smokers

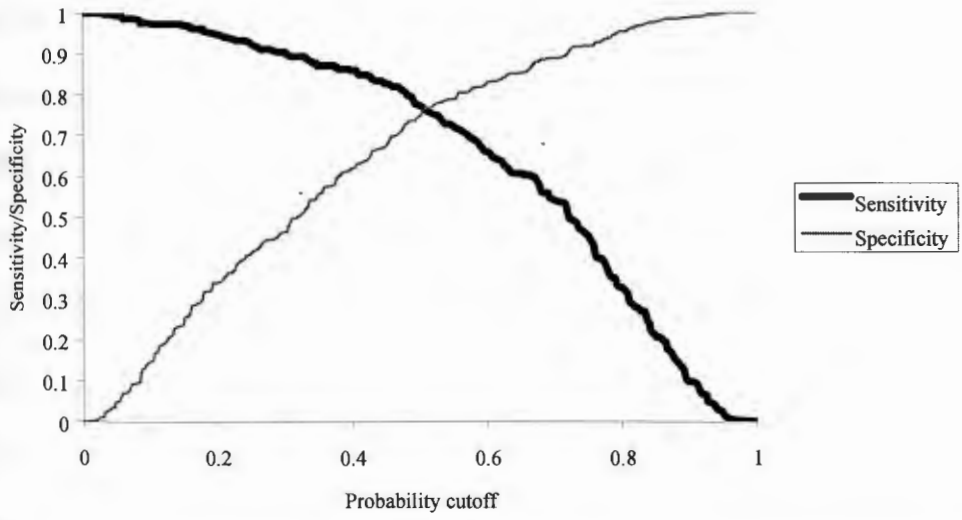

Figure 5.6. Sensitivity and specificity across probability cutoff points for the DFA model on smokers

Chapter 6. Factors associated with smoking cessation

Introduction

Smoking rates among Bulgarian adolescents are alarmingly high and keep rising. The percentages of smokers among adolescents are 24% for males and 31% for females (Corrao et al., 2000). This situation poses two immediate tasks for public health officials – one is to develop good prevention programs to stop further increases in the smoking rates among this segment of the population and the other is to develop programs that will help current smokers to quit. An important prerequisite for the successful development of such programs is good understanding of the factors that influence smoking initiation and maintenance in adolescence. While this need has given rise to a substantial body of research into the psychosocial correlates of smoking in the US (US Surgeon general, 2000), research on this topic for Bulgaria is virtually missing. The goal of the current part of the study was to partially fill this gap by exploring the factors that contribute to successful smoking cessation among adolescent in Bulgaria. A cross sectional study was designed to assess the factors traditionally associated with smoking such as stress (Koval, Pederson, Mills, McGrady, & Carvajal, 2000; SiQuira, Diab, Bodian, & Rolnitzky, 2000; Wills, 1986; Weinrich, Hardin, Valois, & Gleaton, 1996), coping strategies (Vollrath, M., 1998; McCubin, Needle, & Wilson, 1985; Siquierra et al., 2000), self esteem (Glendinning & Inglis, 1999; Kawabata, Shimai & Nishoka, 1998; Jackson & Henricksen, 1997), peer influence (Urberg, Cheng, & Shyu, 1991; Griesler &Kandel, 1998; Jackson, 1997), family influence (Piko, 2000; Wang, Fitzhugh, Westerfield, & Eddy, 1995; Proescholdbell, Chassin, & MacKinnon, 2000) and tobacco related marketing (Unger, Cruz, Schuster, Flora, & Johnson, 2001). In addition the TTM

framework was used to evaluate the readiness of participants to quit smoking through the stages of change algorithm. The influence of their cognitive appraisals of the costs and benefits of smoking was assessed through the decisional balance construct and their level of self-efficacy was assessed through the temptation construct. It is hypothesized that the TTM constructs will be good predictors of being an ex-smoker (compared to a smoker) and being committed to remain smoke-free (compared to not), along with levels of stress and peer and family influences.

Methods

Procedure

The sample for this project consisted of students in the last grades of high school (15-19 years old) recruited in 12 randomly selected high schools of the two largest cities in Bulgaria (Sofia and Plovdiv). The University of Rhode Island Institutional Review Board approved all data collection protocols. The schools were selected to represent the major school types in the country (with general, technical and humanitarian profile). The principals of 14 schools were approached with a request for participation. Two of the schools declined due to the approaching end of the semester and in one of the schools the students had recently participated in a different study exploring risky behaviors. After permission was obtained from the principal of a school further arrangements were made with a teacher for the exact time of the data collection. The investigator administered the survey materials. All participants were presented an assent or consent form prior to their participation and were offered a small incentive for their time (a set of pens and a small organizer). The survey

materials were distributed along with a white envelope in which participants sealed and returned their anonymous answers. None of the students declined participation and only 5 empty cards were returned.

Measures

The full battery consisted of a number of measures translated for the first time into Bulgarian and used with a Bulgarian sample. The majority of the measures were TTM constructs. In addition some stress and family influence measures, as well as items related to tobacco related marketing and peer influence were included to answer some specific research questions. All participants were presented with the full battery of instruments. The first part, including demographics and stress questions, was the same for all participants. After that, depending on their smoking status participants were guided through one skip pattern to one of two different sets of items for smokers or for nonsmokers. Only the measures relevant to the current analysis will be presented here.

Smoking status definition questions: Two questions were used to determine the smoking status of participants. The first divided subjects in ever smokers and never smokers. The second differentiated between never smokers, regular smokers, experimental smokers and quitters. Depending on his or her smoking status each participant received a battery of TTM measures. The regular smokers and the quitters were collapsed into the group of smokers and ex-smokers and received the following scales:

Demographic section: This section consists of a set of questions assessing age, gender, ethnicity, grade level, type of school, level of parents education and future plans for all students. It also includes the date of completion of the survey.

Perceived Stress Scale: A 14 item scale designed to measure the degree to which situations in ones life are appraised as stressful (Cohen, Kamarck, Mermelstein, 1983).

RISCI: The Rhode Island Stress and Coping inventory is a 10 item scale assessing physical symptoms and ways of coping with stress (Fava, Ruggiero, & Grimley, 1998).

Family influences: The amount of family support for nonsmoking is assessed by this 4-item scale (Redding, Rossi et al. 1998, 1999).

Stages of stress management for adolescents: This algorithm asks about the consistency and efficacy of stress management and the time devoted to active stress management per day (Mauriello, et al. 2002).

Media Exposure to smoking messages and opinions about smoking: A set of independent questions assessing participants' exposure to media images related to smoking (ads and anti-smoking messages) and some attitudes to smoking are included in the list (questions are adapted from the WHO/CDC GYTS).

Stages of change algorithm for adolescent smokers: This is a 6 item scale for smoking cessation assessing individual's stage of readiness to quit smoking (Pallonen et al., 1998; Plummer et al., 2001).

Decisional balance scale for adolescent smokers (23 items): This scale (Plummer et al., 2001) contains items reflecting pros and cons of smoking and measures the importance of each statement in the decision to quit smoking. The measure was presented in more detail in Chapter 2.

Temptation scales for adolescents (17 items): This scale measures the strength of temptation to smoke in different situations (Plummer et al., 2001). (See Chapter 2).

Analytic plan

The question of interest for this chapter was to explore the factors that differentiate smokers in later stages of change (A, M) from those in earlier stages of change (PC, C, PR). For this reason only participants that were classified as smokers or ex-smokers were included in the analyses. Due to the rather small number of participants in Preparation and the very uneven distribution of participants across stages two different analytic strategies were used. In the first one participants were pooled into two groups – one consisting of students in the preaction stages (PC, C, PR) and the other of people in the post-action stages (A, M). This group membership was used as an outcome variable in a series of logistic regression analyses followed by a discriminant function analysis (DFA). In the context of the social sciences, the two methods are usually used to answer different research questions with logistic regression used more for determination of significant predictors in problems with binomial outcomes and DFA for prediction of group membership and classification. With contemporary statistical packages both methods can be used to answer both questions related to design of classification rules and creation of linear function that best discriminate between categories. A secondary goal of this analysis was to compare the results of the two methods. A more detailed presentation of the model building strategy was presented in Chapter 5.

In an alternative approach the stages of readiness to quit smoking was used as the outcome variable with four levels and a discriminant function analysis was performed to determine which variables differentiate the best among the stages. SPSS 11.5 was used for all data analyses.

Results

Participants

The study procedure resulted in the data collected from 673 students (64.8% female, 16.5 years mean age). Of these 276 identified themselves as smokers or ex-smokers and were included in the analyses presented here. The sample was predominantly female (69.5%), with a mean age of 16.7 years. Ninety six percent of the sample self identified as Bulgarian and the rest pointed out some other ethnic, national or religious belonging (Table 1.1). Most of the students were planning to attend college in the country (61.8%) or abroad (18.1%) and had an average GPA of 5.08 on a six point rating scale (equivalent of B). The stages of readiness to quit distribution was as follows: 129 (47.6%) in precontemplation, 82 (30.3%) in contemplation, 3 (1.1%) in preparation, 30 (11.1%) in action and 27 (10.0%) in Maintenance and 5 people could not be staged. Since the number of participants in preparation was very low a combined stage group of C/PR was created. When the stages were pooled into a preaction and postaction group 214 (79.0%) were classified in preaction and 57 (21.0%) in postaction.

Logistic regression results

The descriptive statistics of the variables considered for inclusion in the logistic regression analysis are presented in Table 6.1. Initially univariate tests were performed (t-tests and chi-square tests) to select the variables for inclusion in the model. Variables with p levels lower than .20 were retained for inclusion. Based on the univariate results presented in Table 6.2, 9 of the original variables were retained for further analysis: age, gender, GPA, parents smoking status, number of friends who smoke, attitudes towards bans of smoking, coping pros, temptations and stages of effective stress management.

The correlations among these variables were examined in Table 6.3 but no alarmingly high relationships were observed.

The analysis proceeded with a logistic regression model containing all nine variables (see Table 6.4) and the collapsed stage distribution as an outcome variable (quitter = 1). The strength of each predictor was evaluated through the Wald tests and the likelihood ratio tests. Based on these criteria gender, GPA, number of smoking friends and stages of stress management were excluded from further models. Through one intermediate model the coping pros variable was also excluded from the final model, since it failed to reach significance and did not significantly improve the fit of the model.

The final main effects model had four predictors: age, parents smoking, attitudes towards smoking bans and temptations and is presented inTable 6.5.

At the next step four potential two-way interactions were examined, but none of them reached significance and none was included in the model. The four predictors model demonstrated a good fit as indicated by the omnibus chi-square test $\chi 2\ (6) = 63.70$, $p < .05$ and the Hosmer Lemeshow test $\chi 2\ (8) = 13.06$, $p > .05$.

The model was used to create a classification rule with equal prior probabilities for the two groups. The discriminatory power of the model indicated by the area under the ROC curve (see Figure 6.1) was very good with a value of .823. The correct classification rate for the preaction group was 94.3% and for the postaction group 39.6% leading to an overall correct classification rate of 82.3%. The chance classification rate with equal prior probabilities is 50% for both groups, so it can be concluded that despite the rather good overall correct classification rate the model had rather low sensitivity.

This problem is most likely due to the big differences in the sample sizes of the two groups and the use of equal prior probabilities.

Discriminant function analysis results

Two separate DFA were conducted. The first one predicted membership in the same two groups derived through collapsing the stages of change that were used in the logistic regression analysis. The second analysis used as an outcome variable four stages of change – PC, combined C/PR, A and M.

The univariate tests results were used for initial screening of variables to be included in the first analysis (see Table 6.2.). The same variables were selected for initial inclusion in the analysis as for the logistic regression procedure (age, gender, GPA, parents smoking status, number of friends who smoke, attitudes towards bans of smoking, coping pros, temptations and stage of effective stress management). The analysis started through evaluation of the underlying assumptions. The sizes of the two groups were rather unequal, with 51 subjects in the smaller group and an 80:20 ratio between the groups. The two groups were examined separately for normality of the predictors. The only variable that demonstrated high departures from normality was the number of smoking friends for the pre-action group. Since the analysis is rather robust to this violation, the variable was not transformed. No univariate outliers were detected. Both samples were examined for multivariate outliers through assessment of the Mahalonibis distance (Tabachnik & Fidel, 2000) and no outliers were detected. The Box's M statistic indicated that the assumption for homogeneity of variance-covariance matrices was not violated.

Since no serious violations of the assumptions were discovered, a direct discriminant function analysis was performed next. Unlike the logistic regression procedure, the discriminant function procedure in SPSS does not automatically create dummy codes for categorical variables. For this reason parents' smoking status was dummy coded prior to analysis, with no smokers in the house as the reference group. Since this analysis involved only two groups, a single discriminant function was calculated with $\chi^2(11) = 64.14$, $p < .001$ and corresponding group centroids of .290 for the Preaction group and –1.08 for the postaction group. The standardized discriminant coefficients suggested a solution identical to the final logistic regression model: the variables that had the highest coefficients were age, parents smoking, temptations and attitudes towards smoking bans in public places (see Table 6.6). However when the loading matrix of correlations between predictors and the discriminant function was examined, age had a lower loading than the number of friends who smoke indicating that it had a weaker association with the underlying construct differentiating between the two groups. This high loading for friends who smoke can be explained with the violation of the assumptions of normality in the bigger of the two groups. Another potential explanation can be provided by the large difference in the sample sizes of the groups.

A linear classification rule with equal prior probabilities was created. The model had an overall classification rate of 76.3% correct overall classification (73.4% cross-validated rate) and good discriminatory power with area under the ROC curve of .823 (see Figure 6.1). Even though the same predictors were used in the discriminant function, the hit rate for the postaction group was much better than that in the logistic regression

and at 72.5% was better than chance indicating higher sensitivity for the DFA rule (see Table 6.11).

At the next step, the variables that did not emerge as significant predictors were excluded from the analysis and a reduced model was explored. The model contained only age, temptations, parents smoking status and attitudes towards smoking bans as predictors. The resulting discriminant function was significant χ^2 (6) = 65.72, p < .001 with corresponding group centroids of .289 for the Preaction group and –1.06 for the postaction group. The proportion of explained variance remained unchanged (36%) and the classification accuracy was only slightly reduced 73.8% (72.2% with cross-validation) so the reduced model was retained as the final solution and is presented in Table 6.7.

In order to acquire more specific information on the variables that discriminate between stages of change, a second set DFA was conducted with stages of readiness to quit smoking (PC, C/PR, A, M) as the outcome variable. In order to narrow down the list of variables to be included in the model a one way analysis of variance was performed with stage membership as the grouping variable and the variables of interest as dependent variables. As can be seen from the results presented in Table 6.8, the variables selected for further analysis were age, GPA, pros and cons of quitting, temptations, family influences, number of smoking friends, stages of effective stress management, attitudes towards smoking bans in public places and the belief that smoking is harmful to health.

The analysis started with a data screening. The sample sizes for the four groups were very unequal with the smallest group having only 20 participants in it. Such small sample sizes can be a problem and decrease the robustness of the tests. However the

assumptions of normality and equality of variance-covariance matrices were not violated as indicated by Box's M and no outliers were detected.

Direct DFA using all selected variables was performed next. Three discriminant functions were calculated with a combined $\chi^2(30) = 107.82$, $p < .001$. After the first function was removed the relationship between predictors and groups was still strong $\chi^2(18) = 41.33$, $p < .001$. The third function alone however was not significant $\chi^2(8) = 14.63$, $p > .001$. The first discriminant function accounted for 64.0% of the differences between groups and the second for 23.5%. The first discriminant function differentiated people in Maintenance from people in the first two stages, while the second function separated most notably people in PC from the contemplators. The model had a satisfactory classification rate of 50.9%.

At the next step the structure matrix was examined in order to interpret the functions (see Table 6.9). As can be seen from Table 6.9, many of the predictors had very low coefficients and poor loadings on the factors. Since the sample size in one of the groups was very small, a more parsimonious model is preferable. For this reason all predictors with standardized coefficient lower than .35 and matrix loadings lower than .45 were excluded and a second DFA was performed with temptations, attitudes towards smoking bans, family support, stages of stress and belief that smoking is harmful to health as predictors. Since the third discriminant function was not significant the analysis was constrained to extract a matrix loading for only two functions. In this smaller model the first discriminant function accounted for 59.6% of the variance and the second for 30.5%. Two predictors loaded on the first function (Table 6.10) – temptations and attitudes towards smoking bans in public places, suggesting that the dimension that

separates the people in Maintenance from people in the early stages best is self efficacy (see Figure 6.4). People in the Maintenance group are less tempted to smoke and have the most favorable attitudes towards bans of smoking in public places as would be predicted by theory. The second discriminant function had highest loadings on the family support scale, the stress management staging, and the variable assessing the belief that smoking is harmful to health. These are the dimensions that differentiate the people in Precontemplation from people in Action best. People that are trying to quit smoking report that they cope with stress better, have more family support, and have a stronger belief that smoking is harmful to health.

Once again a classification rule with equal prior probabilities was used. The rate of classification was not dramatically reduced in the smaller model. With equal probabilities for the four groups the rate of correct classification was 47.9% (44.2% with jackknifed estimate) (see Table 6.12). Due to the great discrepancies in the sample sizes the classification rate was also computed from prior probabilities from group sample size and the rate of correct classification was improved to 57.9% (56.6% cross-validated). It should be noted, however, that this method would be acceptable only under the assumption that the group sample sizes reflect the actual stage distribution in the population.

Discussion

Factors associated with smoking cessation

It was expected that the TTM constructs would be related to the stages of smoking cessation along with peer pressure, family influences and levels of perceived stress. The results of the study confirmed the importance of self-efficacy expressed in the ability to

manage tempting situations as an important skill for people in the advanced stages of smoking cessation. After controlling for age and the smoking status of parents, however, the other two TTM constructs did not add additional explanatory power and were dropped from the model. The only other variable that was strongly associated with quitting was the attitude towards smoking bans in public places, with quitters expressing more favorable attitudes. The problem with this variable was its low reliability since in the current study, it was measured by a single item. Its strong association with smoking behavior, however, warrants further research and development of a better measure.

More precise information on the factors differentiating people in the different stages of smoking cessation was provided by the DFA with multiple groups outcome. The hypothesis that lower levels of stress and better coping skills would be associated with successful quitting was only partially supported. The results suggest that the practice of effective stress management can be important in making the decision to try to quit smoking. In addition, the variables that were identified by the binary outcome model (temptations and attitudes towards smoking bans in public places) differentiated well between people in the early stages and people in Maintenance. A different set of variables separated people in the Precontemplation stage from people in the combined contemplation/preparation stage group. The factors supporting the important decision to try to quit smoking were more family support for being smokefree, more effective stress management, and a stronger belief that smoking is harmful to health. In general, these results support the idea that tailored interventions are needed for people at different levels of readiness to quit, consistent with the Transtheoretical model.

Comparisons of results from Logistic Regression and Discriminant Function Analysis

Both logistic regression and discriminant function analysis were used to explore the factors associated with quitting and differentiating between smokers and quitters. The two approaches identified identical variables with high-standardized coefficients. When the correlations of the variables with the discriminant function were examined, however, high standardized coefficients did not always translate into high matrix loadings.

The classification rules of the two models produced very close overall correct classification rates, but as the groups sample sizes were very different, the expected lower specificity (see Chapter 5) for the logistic model was observed (see Figures 6.2 and 6.3).

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Table 6.1. Descriptive statistics of the variables of interest

Variable	Preaction			Postaction		
	N	Mean	SD	N	Mean	SD
	214	16.77	1.05	57	16.46	1.03
GPA	214	5.02	.81	57	5.35	.79
Plans for the future	213	2.00	1.42	56	1.88	1.35
Father's education	213	2.52	1.53	57	2.49	1.66
Mother's education	214	2.39	1.53	214	2.39	1.53
Pocket money a day	211	3.52	2.14	57	3.35	2.44
# of smoking friends	214	3.79	.56	57	3.40	.75
# Media antismoking messages	214	3.70	1.13	57	3.82	1.10
# Antismoking ads at events	214	4.09	.98	57	3.91	.91
# Cigarette ads in media	214	3.23	1.29	57	2.93	1.27
# Cigarette ads at events	214	3.09	1.33	57	3.18	1.34
Possession cigarette brand logo item	214	4.23	.96	57	4.30	.93
Smoking harmful to health	214	3.68	.55	57	3.72	.53
Hard to quit smoking	214	2.80	.99	57	2.61	.98
Bans on smoking	214	2.03	.995	57	2.67	1.01
TCONSC	207	49.66	10.32	54	51.60	8.59
TCOPROSC	206	51.01	9.38	55	46.35	11.36
TSOPROSC	204	49.85	10.14	55	50.25	9.61
Temptations	195	52.01	9.00	53	42.41	10.01
Positive Social	200	51.63	9.29	53	43.59	9.94
Weight Control	200	50.87	10.39	54	46.38	7.43
Habits Strength	200	51.39	9.54	54	44.54	9.85
Negative Affect	200	52.34	8.50	53	41.47	10.69
PSS Coping	209	49.76	9.77	57	50.74	10.71
PSS Stress	208	50.25	10.21	55	49.15	8.96
PSS Total	201	50.21	9.84	55	49.22	10.30
RISCI Coping	211	49.71	10.08	56	51.27	9.88
RISCI Stress	209	50.30	10.04	53	48.83	9.35
Family influences	212	50.33	10.11	53	49.09	9.74
Staging Stress	213	2.84	1.51	56	3.23	1.67

Table 6.2. Univariate tests of variables of interest

	t	df	p	95% CI of the Difference	
				Lower	Upper
Age	**1.983**	**269**	**.048**	**.002**	**.618**
GPA	**-2.748**	**269**	**.006**	**-.570**	**-.094**
Plans for the future	.591	267	.555	-.292	.542
Father's education	.129	268	.897	-.426	.486
Mother's education	.239	269	.812	-.395	.504
Average pocket money a day	.518	266	.605	-.478	.819
Parents' smoking	**3.66**	**268**	**.001**	**.294**	**.976**
How many close friends smoke	**4.245**	**269**	**.001**	**.205**	**.559**
# Media antismoking messages	-.739	269	.461	-.453	.206
# Antismoking ads at events	1.254	269	.211	-.103	.466
# Cigarette ads in media	1.590	269	.113	-.072	.680
# Cigarette ads at events	-.412	269	.680	-.473	.309
Possession cigarette brand logo item	-.488	269	.626	-.349	.210
Smoking harmful to health	-.513	269	.609	-.202	.119
Hard to quit smoking	1.258	269	.209	-.105	.475
Banning smoking in public places	**-4.266**	**269**	**.001**	**-.927**	**-.341**
Cons	-1.271	259	.205	-4.946	1.065
Coping Pros	**3.131**	**259**	**.002**	**1.733**	**7.606**
Social Pros	-.262	257	.794	-3.399	2.601
Temptations	**6.712**	**246**	**.001**	**6.778**	**12.408**
Positive social	5.514	251	.001	5.162	10.899
Weight Control	2.977	252	.003	1.520	7.464
Habit Strength	4.650	252	.001	3.948	9.750
Negative affect	7.820	251	.001	8.133	13.609
PSS Coping	-.662	264	.509	-3.922	1.948
PSS Stress	.727	261	.468	-1.876	4.073
PSS Total	.650	254	.516	-1.995	3.960
RISCI Coping	-1.035	265	.301	-4.533	1.408
RISCI Stress	.963	260	.336	-1.532	4.467
Family influence	.807	263	.420	-1.791	4.281
Staging Stress	**-1.709**	**267**	**.089**	**-.853**	**.060**

Note: Bolded items attained significance.

Table 6.3. Correlations of variables considered for inclusion in the LR model

	Parents smoke	Age	GPA	# of smoking friends	Ban on smoking	Coping Pros	TMPT	Stress stage
Gender	.031	.015	.163**	.050	.108	-.030	.171**	.145*
Parents smoke		-.051	-.111	.119*	-.050	.011	.073	-.018
Age			-.130*	-.028	.039	.043	-.047	.060
GPA				-.094	.167**	.027	-.156*	.234**
# of smoking close friends					-.299**	.157*	.270**	-.048
Ban on smoking						-.302**	-.245**	.202**
Coping Pros							.533**	-.073
Temptations								-.039

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 6.4. Initial logistic regression model

	B	S.E.	Wald	df	p	OR	95.0% C.I.for OR	
							Lower	Upper
Age	-.451	.193	5.442	1	.020	.64	.44	.93
GPA	.015	.260	.003	1	.954	1.02	.61	1.69
How many close friends smoke	-.243	.273	.791	1	.374	.79	.46	1.34
Parents' smoking			8.397	3	.038			
No (Reference)								
Only father	-.487	.564	.745	1	.388	.62	.20	1.86
Only mother	-.929	.544	2.915	1	.088	.40	.14	1.15
Both	-1.368	.488	7.852	1	.005	.26	.10	.66
Ban on smoking	.421	.207	4.148	1	.042	1.52	1.02	2.28
Coping Pros	.041	.025	2.851	1	.091	1.04	.99	1.09
Temptations	-.126	.028	20.266	1	.001	.88	.84	.93
Stage stress	.134	.123	1.178	1	.278	1.14	.90	1.46
Gender	.042	.422	.010	1	.922	1.04	.46	2.38
Constant	10.27	4.254	5.837	1	.016			

Table 6.5. Final logistic regression model

	B	S.E.	Wald	df	Sig.	OR	95.0% C.I.for OR	
							Lower	Upper
	-.420	.177	5.607	1	.018	.66	.46	.93
Parents' smoking			10.791	3	.013			
No (Reference)								
Only father	-.667	.545	1.494	1	.222	.51	.18	1.50
Only mother	-1.037	.514	4.063	1	.044	.36	.13	.97
Both	-1.533	.478	10.292	1	.001	.22	.09	.55
Ban on smoking	.479	.182	6.894	1	.009	1.61	1.13	2.31
Temptations	-.105	.021	24.569	1	.001	.90	.86	.93
Constant	10.374	3.322	9.753	1	.002			

Table 6.6. Standardized canonical discriminant function coefficients and structure matrix loadings

	DFA coefficients	Matrix loadings
[redacted]	.349	.195
Gender	.063	.136
GPA	.002	-.234
How many close friends smoke	.189	.441
Father smokes	.156	.043
Mother smokes	.264	.044
Both smoke	.484	.273
Banning smoking in public places	-.331	-.442
Coping Pros	-.216	.317
Temptations	.800	.750
Staging Stress	-.156	-.198

Table 6.7. Standardized canonical discriminant function coefficients and structure matrix loadings final model with binary outcome

	DFA coefficients	Matrix loadings
[redacted]	.347	.206
Father smokes	.216	-.028
Mother smokes	.341	.066
Both parents smoke	.557	.261
Banning smoking in public places	-.397	-.496
Temptations	.742	.768

Table 6.8. ANOVA screening results

	F (df)	p
[redacted]	**2.43 (3, 270)**	**.066**
GPA	**3.38 (3, 270)**	**.019**
Plans for the future	1.14 (3, 268)	.335
Father's education	.81 (3, 269)	.488
Mother's education	.84 (3, 270)	.472
# of smoking friends	**6.26 (3, 270)**	**.001**
Smoking harmful	**7.43 (3, 270)**	**.001**
Hard to quit smoking	.69 (3, 270)	.559
Smoking ban	**11.70 (3, 270)**	**.001**
Coping Pros	**4.35 (3, 260)**	**.005**
Social Pros	.54 (3, 258)	.657
Temptations	**15.63 (3, 244)**	**.001**
RISCI Coping	.83 (3, 266)	.478
RISCI Stress	.59 (3, 261)	.616
Family influence	**6.54 (3, 264)**	**.001**
PSS Coping	.58 (3, 265)	.629
PSS Stress	.67 (3, 262)	.574
PSS Total	.61 (3, 255)	.609
Stage stress	**3.85 (3, 268)**	**.010**
Cons	**4.14 (3, 260)**	**.007**

Note: Bolded variables attained significance.

Table 6.9. Structure matrix and standardized coefficients of initial DFA (4 groups)

	Matrix Loadings			Standardized coefficients		
[redacted]ptations	.711(*)	.250	.345	.702	.282	.382
Banning smoking in public places	-.516(*)	.332	-.058	-.382	.128	-.022
# of smoking friends	.422(*)	.096	-.032	.289	.126	-.302
Coping Pros	.382(*)	-.144	.231	-.118	-.095	.070
GPA	-.290(*)	.036	-.089	-.106	-.047	-.095
Family influence	.011	.820(*)	-.445	.250	.641	-.692
Stage Stress	-.264	.491(*)	.168	-.175	.284	.259
Cons	-.194	.440(*)	.170	-.087	.097	.098
Smoking harmful to health	-.228	.522	.577(*)	-.279	.289	.708
[redacted]Age	.197	-.073	.233(*)	.340	-.060	.238

Table 6.10. Structure matrix and standardized coefficients of final DFA (4 groups)

	Matrix loadings		Standardized coefficients	
[redacted]mptations	.808*	.251	.741	.287
Banning smoking in public places	-.597*	.345	-.508	.167
Family influence	.030	.813*	.241	.645
Smoking harmful to health	-.233	.574*	-.230	.400
Staging Stress	-.233	.460*	-.163	.252

Table 6.11. Classification rate comparisons for models with binary outcome

		Logistic regression			Discriminant function analysis		
Model	Actual group	0	1	Overall classification rate	0	1	Overall classification rate
[redacted]reaction	Pre (0)	183	32		144	14	
vs.	Post (1)	11	21	82.6%	51	39	73.8%
Postaction	Total	194	53		195	53	
Group classification		*94.3%*	*39.6%*		*73.8%*	*73.6%*	

Table 6.12. Classification rates for DFA with multiple groups

		Predicted Group Membership				
		PC	C/PR	A	M	Total
Observed counts	PC	65	26	14	11	116
	C/PR	26	34	8	9	77
	A	7	7	3	10	27
	M	3	3	2	14	22
Correct group classification		*56.0%*	*44.2%*	*11.1%*	*63.6%*	
Cross-validated classification						
Observed counts	PC	58	30	15	13	116
	C/PR	25	32	12	8	77
	A	6	5	6	10	27
	M	4	3	4	11	22
Correct group classification		*50.0*	*41.6*	*22.2*	*50.0*	

47.9% of original grouped cases correctly classified.
44.2% of cross-validated grouped cases correctly classified.

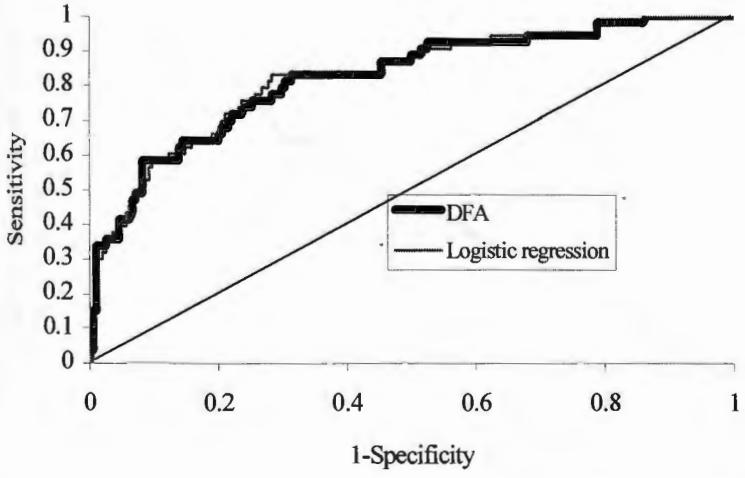

Figure 6.1. ROC's for DFA and LR binary outcome model

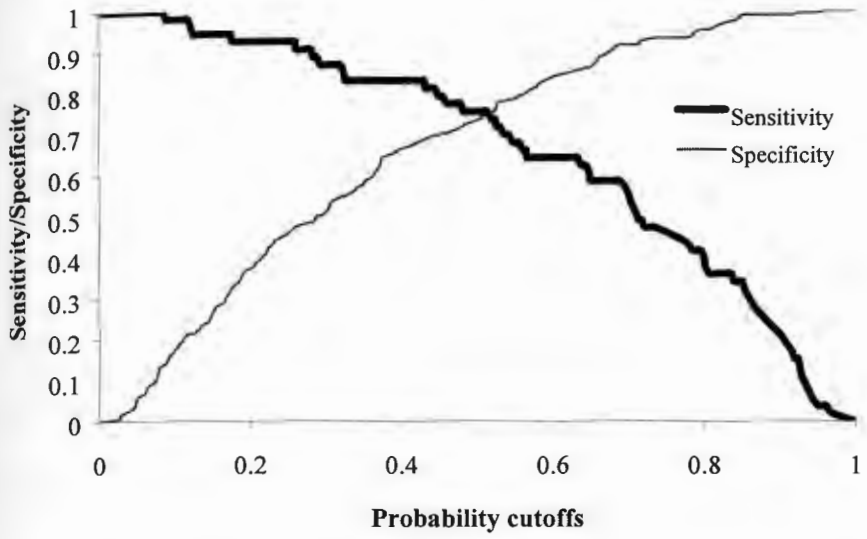

Figure 6.2. Sensitivity and specificity across probability cutoff points for the DFA model for smokers

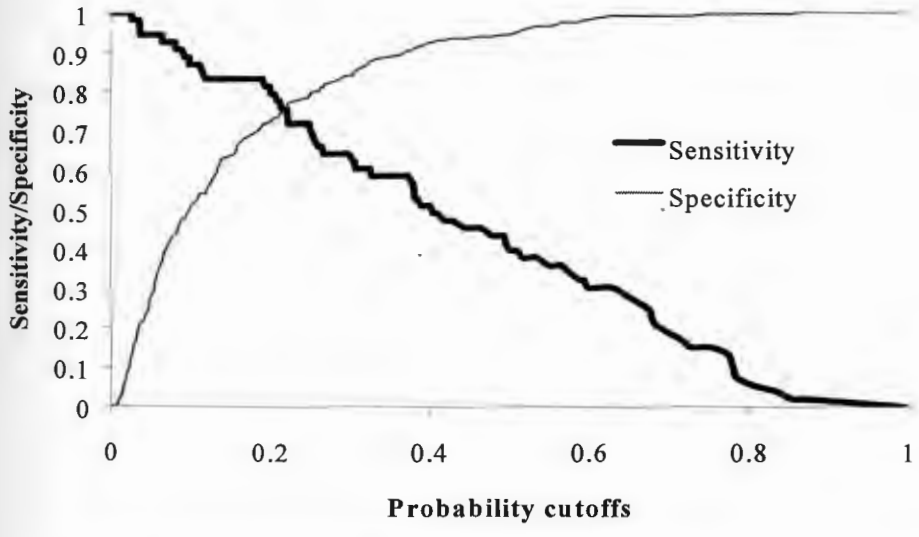

Figure 6.3. Sensitivity and specificity across probability cutoff points for the LR model for smokers

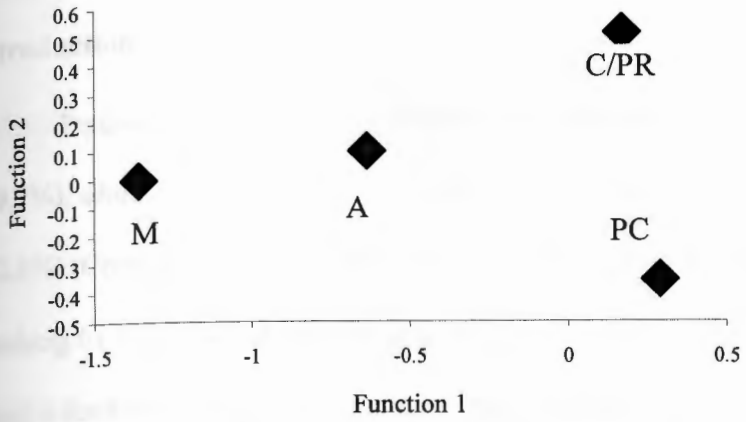

Figure 6.4. Map of groups across two DFA functions

Chapter 7: Variables that Differentiate Nonsmokers Committed to Remaining Smokefree from Other At Risk Nonsmokers

Introduction

Percentages of smokers in Bulgaria have reached alarmingly high levels among men (49.2%), adolescents (24% for males and 31% females) and even health professionals (52.3%) (Corrao et al., 2000). According to other sources these figures are even higher, reaching 61.1% smoking prevalence among male population (Uitenbroek, 1996) and the trend is for further increase. At the same time the mortality rate for the population shows a steady increase in the last decade with invariably increasing numbers in the leading cause of death – cardiovascular diseases (Ginter, 1997). Research indicates that smoking initiation for adult users usually occurs during adolescent years (Fiore, 1992) and smoking is unlikely to occur if it is not started during adolescence (US Surgeon General, 1994). It is estimated that around 50% of teenage youth that initiate smoking remain addicted for 16 to 20 years (Najem, Batuman, Smith, & Feuerman, 1997).

One of the important measures needed to prevent further increase in the smoking rate and the resulting public health costs is the development of effective prevention programs. Some efforts have been made to control tobacco products in Bulgaria. Advertising and sales to minors are officially banned, but the lack of appropriate enforcement leads to very low effectiveness. Smoking is prohibited in educational and health facilities, government buildings and public transportation but it is allowed and heavily practiced in all other public places (restaurants, bars, pubs, clubs), which are often visited by youth and become a powerful channel for promotional activities for the tobacco companies (World Health Organization, 1997). As a large producer of tobacco, Bulgaria maintains very low

prices of cigarettes of domestic brands ($0.40 average cost per pack), which has more than 90% of market share. This low cost facilitates easy access to tobacco products.

Even though in the last two years main changes in tobacco related policy in Bulgaria have been introduced (WHO, 2002; Ministry of Health, 2002) the support for health promotion activities, smoking prevention and educational activities in the last decade has been particularly weak (Balabanova, Bobak & McKee, 1998). The reports on some prevention strategies most often describe some pilot programs and prevention efforts (Anguelov et al., 1999), and short term campaigns such as "Quit and Win" (Tulevski & Vasilevski, 2000) and theme competitions "No to cigarettes" (Kotarov, 2002), performed as a part of an international campaign.

This context does not provide many anti-tobacco messages, placing adolescents at high risk for smoking initiation and accompanying health hazards and underscoring the need for good smoking prevention programs. The development of such programs requires better understanding of the factors that influence smoking initiation and maintenance in adolescents. This need has given a rise to a substantial body of research into the psychosocial correlates of smoking, attempting to explain the mechanisms of smoking initiation (US Surgeon General, 2000). As Pederson et al. (1998) note, there are problems in interpreting and summarizing the results of these studies, due to differences in study designs, variety of measures and large variability of the combinations of included variables. Despite these inconsistencies there are a number of factors that emerge across a large number of the proposed models and thus allow for some more general statements (Pederson et al., 1998). Variables that have been consistently associated with smoking are stress (Koval, Pederson, Mills, McGrady, & Carvajal, 2000; SiQuira, Diab, Bodian, & Rolnitzky, 2000; Wills, 1986;

Weinrich, Hardin, Valois, & Gleaton, 1996), coping strategies (Vollrath, M., 1998; McCubin, Needle, & Wilson, 1985; Siquierra et al., 2000), self esteem (Glendinning & Inglis, 1999; Kawabata, Shimai & Nishoka, 1998; Jackson & Henricksen, 1997), peer influence (Urberg, Cheng, & Shyu, 1991; Griesler &Kandel, 1998; Jackson, 1997), risk taking (Coogan, 1998) and family influence (Piko, 2000; Wang, Fitzhugh, Westerfield, & Eddy, 1995; Proescholdbell, Chassin, & MacKinnon, 2000). Although not so broadly studied, tobacco related marketing has also been often pointed out as a risk factor for smoking initiation (Unger, Cruz, Schuster, Flora, & Johnson, 2001) and could play an important role in a weakly regulated tobacco marketing environment.

Comparable studies, studying predictors of smoking behavior in Bulgaria are extremely rare. The goal of this study is to fill part of this gap and explore the factors associated with elevated risk for smoking initiation among nonsmoking Bulgarian adolescents. The results can be used to inform the development of future smoking prevention programs for this population.

Methods

Measures

All the measures on which data was available from the subsample of nonsmokers were used in the analyses. These included the full battery used in the study with the exception of the temptation scale and the decisional balance scale for smoking cessation. All the measures were described in detail in Chapter 1 and copies are provided in the appendices.

Analytic Plan

The goal of this analysis was to identify the factors associated with elevated risk of smoking initiation among non-smokers and to examine their ability to discriminate between the two groups. The stages of readiness to make a commitment to stay smoke free were used to identify participants at higher risk of smoking initiation. Students in the PC, C and PR stages of readiness to commit to staying smoke free were collapsed into one category labeled "elevated risk" and participants in A and M were collapsed into a low-risk group. Thus the outcome variable was dichotomized ("elevated risk"=1) and a logistic regression analysis following the procedure outlined in the previous chapter was performed. Originally a DFA with stage membership as an outcome was planned as an alternative analysis, but due to the small number of people in the C, PR and A stages the discriminant analysis was performed on the dichotomized variable once again following the procedures described in Chapters 5 and 6.

Results

Participants

For this analysis out of the 673 participants only the data of the 349 nonsmokers were used. The sample had a mean age of 17 years, predominantly female (61.4%) and 97.1% identified their ethnicity as Bulgarian. The majority of the sample (58.6%) reported excellent performance in the last semester of school. Most of the students planned to attend college: 60.9% planned to attend college in the country and 23.2% were planning to continue their education abroad. The mean amount of daily pocket money was 3.07 leva (mode 2), which is equivalent to $1-1.50 and is enough to purchase two boxes of domestic brand cigarettes (Table 1.1).

Logistic regression

The descriptive statistics for the variables of interest considered for inclusion in this model are presented at Table 7.1. The variables included in the multivariate logistic regression model were selected through a series of univariate tests with smoking risk status (defined as preaction vs. postaction on the prevention staging algorithm) as the outcome variable. The results of these tests are presented in Table 7.2. A liberal p value of .20 was used to select variables for inclusion in the model. Based on this criterion the following variables were selected for the multivariate analysis: smoking status of siblings and parents, smoking allowed in the house, possession of brand logo item, plans for the future, and the items assessing attitudes towards smoking policy, difficulty of quitting and beliefs about relationship between smoking and weight. In addition all TTM constructs (temptations, pros, cons and stages of effective stress management) reached significance and were included in the logistic regression model. The correlations among these variables were examined in order to test for potential collinearity. Parent's smoking status and house rules on smoking had a high negative correlation (-.566) and only the variable with the higher t-score (home smoking) was retained for the multivariate analysis.

The results of the logistic regression model containing all selected variables are presented in Table 7.4. The categorical variables included in the model were dummy coded. The reference groups were participants for whom smoking was not allowed in the house, were not offered a cigarette by a representative and had a non-smoking sibling. The importance of each variable was examined through the Wald statistic (with $p < .01$) and through comparisons with univariate models. Based on these criteria the pros, cons, temptations, stages of stress and the items assessing attitudes towards smoking policy, belief

that smoking is hard to quit and belief that smoking is harmful to health were retained in the model. The predictors in this intermediate model were examined and the cons, stages of stress management and the item on smoking being hard to quit were excluded, since they failed to reach significance and did not improve the fit of the model.

The results of the model with the remaining variables (pros, temptations, bans on smoking and smoking is harmful) are presented in Table 7.5. All of the included variables were significantly related to the outcome. The coefficients from this reduced model were compared to the coefficients of the full model to check for any marked changes as a potential indicator that an important variable has been omitted. None of the coefficients demonstrated unexpectedly large change, so the analysis proceeded with a refinement of the main effects model. For this purpose the linearity in the logit of the continuous variables was tested using the design variables approach described by Hosmer & Lemeshow (2000). The method uses design categorical variables (determined through the quartiles of the distribution), which are fitted into a model and the resulting estimated coefficients are plotted against the midpoints of the groups. The results suggested that pros, temptations and belief that smoking should be banned in public places are linear. During this analysis, it was discovered that the variable assessing belief in the harms of smoking to health had a zero cell count in the contingency table (no participants in the postaction stage disagreed with the statement). Since this is a numeric problem, which might distort final estimates the variable was transformed into a binary format (agree vs. definitely agree) and the regression analysis was repeated. The results of this analysis are presented in Table 7.6. As can be seen the coefficients did not differ significantly from the model before the recoding and the model was retained as a final main effects model. At the next step, tests for potential interactions were performed. All

possible two-way interactions were examined, but none was significant and hence none was included in the model.

The final step was assessment of the goodness of fit of the final model. Both the Hosmer and Lemeshow test (χ^2 (8) = 12.59, p > .05) and the omnibus chi-square test (χ^2 (4) = 76.58, p < .05) indicated a good fit of the model. The area under the ROC curve was .795, which is indicative of good discrimination (Hosmer & Lemeshow, 2002). A classification rule with equal prior probabilities was used in the analysis. The overall rate of correct classification was 72.7% (Table 7.9), with 84.1% of the low risk group/postaction group and 55.4% of the high-risk group correctly classified. These results indicate high specificity, but low sensitivity of the model.

The final model indicated that consistent with TTM predictions people who had higher scores on the pros scale of staying smoke free had a lower probability of being in the elevated risk group with all other factors being equal. A one point difference in the T-wcores of the scale was associated with a change in the odds ratio of .953. On the other hand, higher scores on the temptation scale were associated with a higher probability of being at risk for smoking initiation. One point increase in temptations score increased the risk of being in the at-risk group by 7%. High scores on both of the other two predictors were associated with a lower probability of being at risk. The belief that smoking is harmful to health is a stronger predictor of being in the group of nonsmokers committed to remaining smokefree (OR .300) than attitudes towards smoking policy (OR .620).

Discriminant Function Analysis

Since the stage distribution did not allow for a test of classification in different stages, DFA was performed with the groups of low and high risk defined for the logistic regression

analysis. The predictors selected were the same as those selected for initial inclusion in LR based on their significant univariate tests. Unlike logistic regression DFA operates under certain assumptions, which were examined prior to analysis separately for both groups. The frequencies of the selected variables were examined first to test for violations of normality. Two of the variables (smoking is hard to quit and free cigarette offered by representative) demonstrated very high kurtosis in the group at low risk suggesting violations of assumptions of normality. No such problems were encountered in the other group and the decision was made not to transform this variable. No important univariate outliers were detected. The presence of multivariate outliers was examined through the Mahalanobis distance. Three cases reached the significant level of the chi-squared distribution, but only one case departed substantially from the cutoff value and was excluded from further analysis. Even though some of the assumptions were violated, the procedure is usually considered robust with adequate group sizes, so the analysis proceeded with the actual DFA.

At the first step all variables were included in the analysis. A total of 266 cases were analyzed 162 of which were in the postaction group. Since there were only two groups in the analysis a single discriminant function was extracted χ^2 (13) = 82.54 $p < .05$, separating between the two groups with centroids of -.491 for the low risk group and .764 for the high risk group. The structure matrix loadings and the standardized coefficients (see Table 7.7) suggested that the same 4 variables derived in the logistic regression analysis were the most important variables that discriminated between the two groups. The overall correct rate of classification was 75.9% when the whole sample was used and 72.2% when jackknife estimation was used.

Since the variables that contributed the most to the underlying discriminant function were the same as those retained in the LR analysis, a second DFA was performed including only the four variables with the highest matrix loadings and standardized coefficients: temptations, pros, attitudes towards public bans on smoking and the belief that smoking is harmful to health. The discriminant function of this reduced model still differentiated between the two groups χ^2 (4) = 78.43, $p < .05$., and group centroids -.461 and .705 for low and high risk respectively. The classification results derived through this analysis were identical to the ones acquired through logistic regression (correct classification rate 72.6% (71.9% cross-validated). The area under the ROC curve was .795 (see Figure 7.1). The DFA classification rule had a better sensitivity, classifying correctly 66.1% in the high-risk group.

Discussion

Factors associated with being at risk for smoking initiation

According to the TTM, people with higher score on temptations to try smoking and lower scores on pros of being smoke free should be at a greater risk for smoking initiation, and thus in earlier stages of being committed to remaining smokefree. This prediction was confirmed by these results, supporting the importance of these constructs for smoking prevention programs. In addition the negative attitudes towards smoking policy were also highly correlated with being at risk for smoking initiation. Even though in the current study it was hypothesized that attitudes are predictors of behavior, this cross-sectional design does not allow for any causal interpretations. As a result it has to be noted that being unwilling to make a commitment to being smokefree could lead to negative attitudes towards smoking bans. Future studies with better measures and more sophisticated longitudinal designs are needed to determine the direction of this relationship.

The last factor associated with elevated risk for smoking initiation was a belief that smoking is less harmful to health. This finding supports efforts to communicate the harmful effects of smoking more clearly as part of prevention programs.

Comparisons of results from Logistic Regression and Discriminant Function Analysis

The two analytic approaches resulted in two models that included identical predictor variables. The overall classification rate for the two models was also very similar. The only difference in the two methods was in the lower specificity of the logistic regression model. Since equal prior probabilities were used in both models the sensitivity and the specificity were examined for DFA and LR models across all probability cutoff points (see Figures 7.2 and 7.3). The graphs suggest that the LR regression model had a lower optimal cutoff point reflecting the difference in the sample sizes of the two groups. This finding supports the conclusion of Chapter 5 that the classification rules of LR would perform better when the population size of the two groups is known and thus prior probabilities can be adjusted to reflect known differences in the size of the groups.

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Table 7.1. Descriptive statistics for the variables of interest for nonsmokers

	Preaction			Postaction		
	N	Mean	SD	N	Mean	SD
[redacted]	124	16.48	1.16	198	16.35	1.16
GPA	125	5.42	0.73	194	5.55	0.65
Plans for the future	124	2.28	1.48	196	1.75	1.17
Father's education	125	2.16	1.53	196	2.37	1.48
Mother's education	124	1.95	1.30	196	2.16	1.35
Pocket money a day	113	3.23	2.11	186	2.94	2.19
# of smoking friends	125	3.13	0.88	198	2.78	0.98
Staging Stress	124	2.77	1.57	196	3.31	1.62
# Media antismoking messages	125	3.72	1.08	198	3.70	1.06
# Antismoking ads at events	125	4.06	0.90	197	4.12	0.90
# Cigarette ads in media	125	3.09	1.42	198	2.94	1.23
# Cigarette ads at events	125	2.96	1.35	196	3.07	1.21
Possession cigarette brand logo item	124	4.36	0.92	198	4.59	0.68
Representative offered free cigarette	125	1.89	0.32	198	1.94	0.23
Smoking and weight	125	2.38	0.90	196	2.33	0.94
Smoking harmful to health	123	3.67	0.62	198	3.94	0.23
Hard to quit smoking	125	2.66	0.97	197	2.96	0.89
Bans on smoking	124	2.67	0.92	197	3.28	0.83
Temptations	117	54.00	12.12	174	47.31	7.80
Negative affect	119	54.02	12.27	177	47.27	7.12
Positive Social	117	53.95	11.94	175	47.48	7.99
Weight control	119	50.52	12.18	176	49.52	8.59
Pros	118	46.16	9.62	178	52.59	9.23
Cons	117	51.98	11.06	178	48.63	9.00
PSS Coping	122	49.49	10.70	190	50.81	9.63
PSS Stress	120	50.53	9.53	190	49.22	10.41
PSS Total	119	50.48	10.06	185	49.07	10.15
RISCI Coping	121	49.60	9.94	190	50.86	10.19
RISCI Stress	122	50.16	9.69	193	49.76	10.27
Family influences	122	49.33	9.72	186	50.03	10.02

Note: Preaction describes PC, C, and PR stages of readiness to make a commitment to remain smokefree. Postaction describes those in A or M for their readiness to make a commitment to remaining smokefree.

Table 7.2. Univariate tests for LR nonsmokers

	t	df	p	Mean Difference	95% Confidence Interval of the Difference	
					Lower	*Upper*
	0.92	320	0.358	0.12	-0.14	0.38
GPA	**-1.63**	**317**	**0.105**	**-0.13**	**-0.28**	**0.03**
Plans for the future	3.58	318	**< .001**	0.53	0.24	0.83
Father's education	-1.24	319	0.217	-0.21	-0.55	0.13
Mother's education	**-1.35**	**318**	**0.177**	**-0.21**	**-0.51**	**0.09**
Pocket money a day	1.14	297	0.256	0.29	-0.21	0.80
# of smoking friends	**3.26**	**321**	**0.001**	**0.35**	**0.14**	**0.56**
Stage Stress	**-2.90**	**318**	**0.004**	**-0.5319**	**-0.89**	**-0.17**
# Media antismoking messages	0.19	321	0.851	0.02	-0.22	0.26
# Antismoking ads at events	-0.64	320	0.522	-0.07	-0.27	0.14
# Cigarette ads in media	1.00	321	0.32	0.15	-0.15	0.44
# Cigarette ads at events	-0.77	319	0.441	-0.11	-0.40	0.17
Possession cigarette brand logo item	**-2.48**	**320**	**0.014**	**-0.22**	**-0.40**	**-0.05**
Representative offered free cigarette	**-1.85**	**321**	**0.065**	**-0.06**	**-0.12**	**0.00**
Smoking and weight	0.47	319	0.64	0.05	-0.16	0.26
Smoking harmful to health	**-5.54**	**319**	< .001	**-0.27**	**-0.37**	**-0.17**
Hard to quit smoking	**-2.92**	**320**	**0.004**	**-0.31**	**-0.52**	**-0.10**
Bans on smoking	**-6.22**	**319**	**< .001**	**-0.61**	**-0.81**	**-0.42**
Temptations	**5.73**	**289**	**< .001**	**6.6908**	**4.39**	**8.99**
Negative Affect	**5.97**	**294**	**< .001**	**6.7433**	**4.52**	**8.97**
Positive Social	**5.55**	**290**	**< .001**	**6.4684**	**4.17**	**8.76**
Weight concerns	0.83	293	0.41	0.9968	-1.38	3.38
Pros	**-5.77**	**294**	**< .001**	**-6.4347**	**-8.63**	**-4.24**
Cons	**2.85**	**293**	**0.005**	**3.3511**	**1.04**	**5.66**
PSS Coping	-1.13	310	0.258	-1.3228	-3.62	0.97
PSS Stress	1.12	308	0.265	1.3138	-1.00	3.63
PSS Total	1.18	302	0.239	1.4019	-0.94	3.74
RISCI Coping	-1.07	309	0.284	-1.2597	-3.57	1.05
RISCI Stress	0.34	313	0.732	0.3985	-1.89	2.69
Family influence	-0.61	306	0.543	-0.7018	-2.97	1.57

Note: Bolded variables attained significance at p<.20

Table 7.3. Initial model for LR nonsmokers

	B	S.E.	Wald	df	p	OR	95.0% C.I.for OR	
							Lower	Upper
[redacted]oking of siblings								
Nonsmokers (Ref)			2.464	2	.292			
No siblings	.106	.414	.066	1	.798	1.11	.49	2.50
Smokers	.597	.382	2.437	1	.119	1.82	.86	3.85
# of smoking friends	.164	.173	.898	1	.343	1.18	.84	1.65
Smoking allowed in house	.008	.316	.001	1	.979	1.01	.54	1.87
Plans for the future	.175	.117	2.235	1	.135	1.19	.95	1.50
Promotional item	-.219	.218	1.011	1	.315	.80	.52	1.23
Offered free cigarette	-.565	.675	.701	1	.403	.57	.15	2.13
Smoking harmful	**-1.108**	**.477**	**5.401**	**1**	**.020**	**.33**	**.13**	**.84**
Hard to quit	-.280	.167	2.790	1	.095	.76	.54	1.05
Ban on smoking	**-.381**	**.185**	**4.219**	**1**	**.040**	**.68**	**.48**	**.98**
Pros	**-.045**	**.017**	**6.865**	**1**	**.009**	**.96**	**.92**	**.99**
Cons	.031	.018	2.818	1	.093	1.03	.99	1.07
Temptations	**.050**	**.017**	**8.519**	**1**	**.004**	**1.05**	**1.02**	**1.09**
Stages Stress	-.159	.096	2.726	1	.099	.85	.71	1.03
Constant	4.511	2.485	3.294	1	.070	90.97		

Note: Bolded variables attained significance at p<.05

Table 7.4. LR nonsmokers final model

	B	S.E.	Wald	df	Sig.	OR	95.0% C.I.for OR	
							Lower	Upper
[redacted]oking harmful	**-1.150**	**.448**	**6.595**	**1**	**.010**	**.32**	**.132**	**.76**
Ban on smoking	**-.478**	**.168**	**8.088**	**1**	**.004**	**.62**	**.446**	**.86**
Pros	**-.049**	**.016**	**9.770**	**1**	**.002**	**.95**	**.924**	**.98**
Temptations	**.068**	**.015**	**20.001**	**1**	**.000**	**1.07**	**1.039**	**1.10**
Constant	4.432	1.853	5.721	1	.017	84.06		

Note: Bolded variables attained significance at p<.05

Table 7.5. LR final model with one variable recoded

	B	S.E.	Wald	df	Sig.	OR	95.0% C.I.for OR	
							Lower	Upper
[redacted]moking harmful[1]	**-1.204**	**.472**	**6.499**	**1**	**.011**	**.30**	**.12**	**.76**
Temptations	**.068**	**.015**	**19.777**	**1**	**.001**	**1.07**	**1.04**	**1.10**
Pros	**-.051**	**.015**	**10.754**	**1**	**.001**	**.95**	**.92**	**.98**
Ban on smoking	**-.475**	**.167**	**8.056**	**1**	**.005**	**.62**	**.45**	**.86**
Constant	1.153	1.095	1.109	1	.292	3.16		

[redacted]y coded

Table 7.6. DFA loadings full model

	Matrix loadings	Standardized coefficients
[redacted]n smoking	-.525	-.289
Pros	-.510	-.341
Smoking harmful[1]	.499	.328
Temptations	.496	.416
Staging Stress	-.308	-.213
Cons	.284	.201
Plans for the future	.276	.194
Hard to quit smoking	-.248	-.189
How many close friends smoke	.245	.103
Smoking allowed in the house	-.215	-.012
Siblings smoke	.176	.204
Cigarette brand logo item	-.148	-.120
[redacted]epresentative offered free cigarette	-.007	.075

[1] Binary coded

Table 7.7. DFA loadings reduced model

	Matrix loadings	Standardized coefficients
[redacted]ros	-.597	-.424
Temptations	.574	.600
Smoking harmful[1]	.550	.356
Ban smoking	-.542	-.382

[1] Binary coded

Table 7.8. Classification rates results

		Logistic regression			Discriminant function analysis		
Model		Observed		Overall classificati on rate	Observed		Overall classificati on rate
	Predicted	0	1		0	1	
Post	Post (0)	143	50		134	36	
	Pre (1)	27	62	72.7%	41	70	72.6%
	Total	170	112		170	111	
Group classification		*84.1%*	*55.4%*		*78.8%*	*63.1%*	

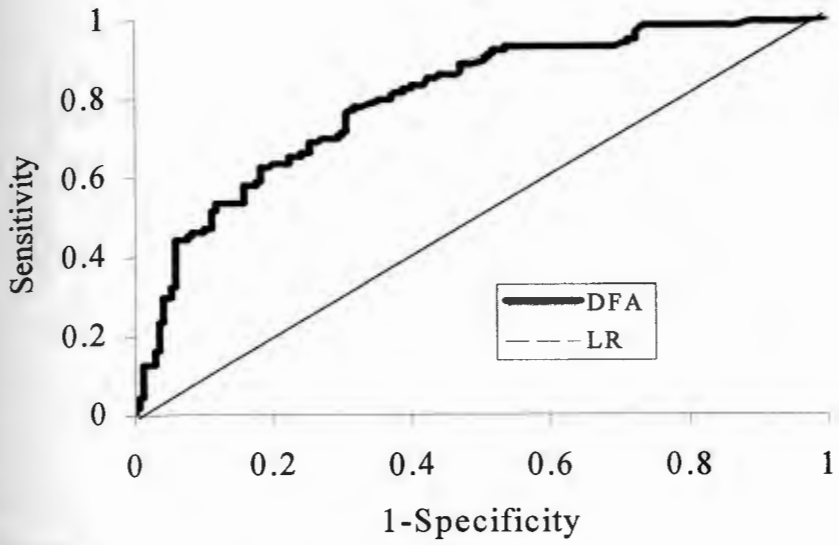

Figure 7.1. ROC's for DFA and LR

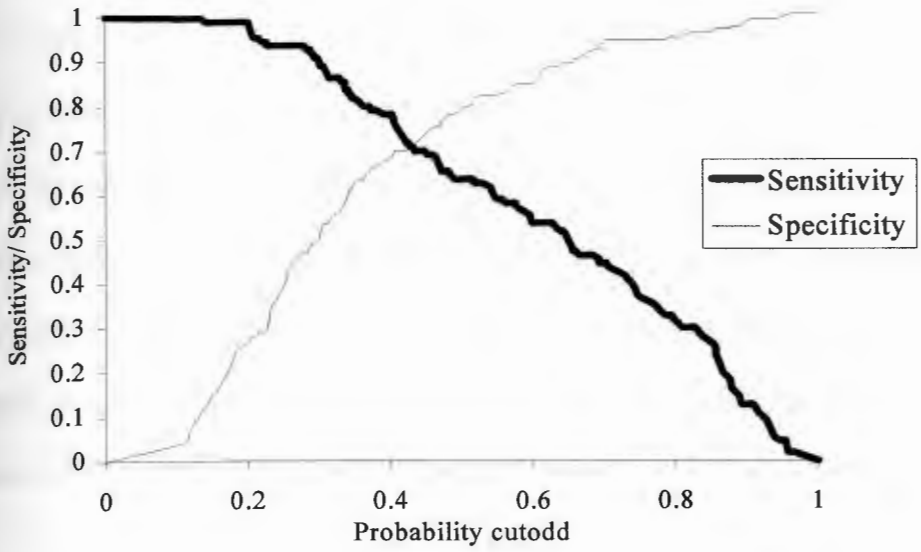

Figure 7.2. Sensitivity and specificity across probability cutoff points for the DFA model

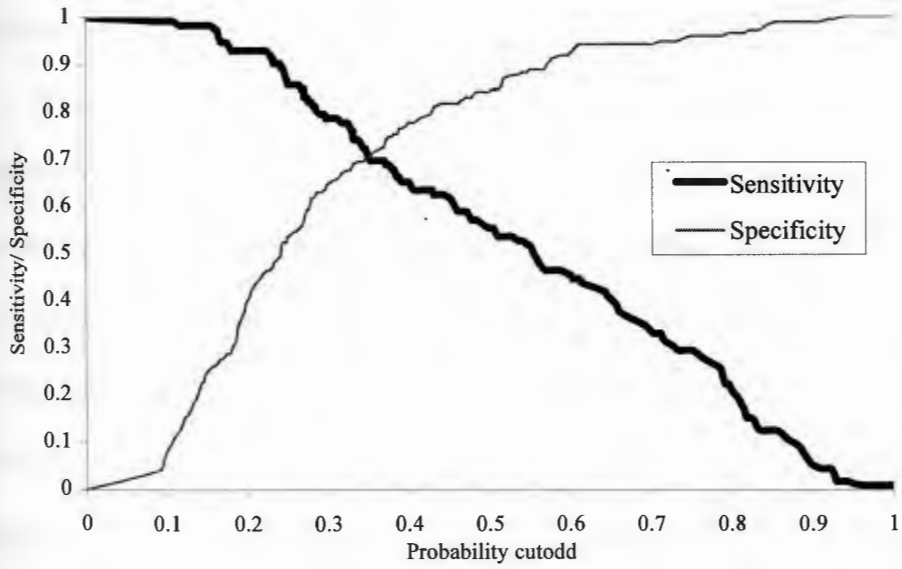

Figure 7.3. Sensitivity and specificity across probability cutoff points for the LR model

Chapter 8: Conclusions, Limitations and Future directions

This dissertation had three main research questions: 1/ Measurement development and validation of smoking and stress related measures for a Bulgarian adolescent sample; 2/ exploratory analyses of socio-demographic and psychological variables associated with smoking and risk for smoking among Bulgarian adolescents and 3/ applied comparison of logistic regression and discriminant function analysis for models with binary outcomes. The goal of this final chapter is to summarize the findings in these three areas and discuss the limitations of the study and future directions for research.

Development and validation of measures

Four scales were developed for major TTM constructs: decisional balance and self-efficacy scales both for smoking cessation and smoking prevention. The measures generally replicated previously reported and theoretically predicted structures confirming hypothesis one.

Valid measures should follow the specific predictions made by the TTM for the distributions across the stages of change. The decisional balance measure should have a cross-over pattern between the pros and the cons (Prochaska et al., 1994; Prochaska, 1994), while the temptation scale is expected to have a linear decreasing pattern (Plummer et al., 2001). To test these predictions the stages of readiness to quit were calculated for the smokers in the sample and the stages of readiness to make a commitment to stay smoke-free were assessed among the nonsmokers. It was hypothesized that the stage distributions for Bulgarian adolescents would have different distribution than those reported for US population (hypothesis #2). Larger percentages of smokers in the precontemplation stage of change and higher percentages of non-smokers

expressing readiness for smoking initiation were expected in the current sample. Results robustly confirmed this hypothesis. Also, the numbers of participants staged in the contemplation and preparation stages were very small both for smokers and non-smokers. Some possible explanations for these findings can be provided by the less restrictive cultural norms for smoking in public places, possible cultural differences in the concept of planning behavior change and finally some measurement problems. Only future studies can determine with more certainty, which of these possibilities or combinations of them are relevant. In this study, these stage distributions presented some problems for the external validation of the measures, since some stages had to be collapsed, before the stage distribution patterns were examined. Despite this obstacle the stage distributions generally confirmed theoretical predictions and hypothesis three of the current study, although the observed effect sizes were smaller than those reported for US adolescents (Plummer et al., 2001).

Overall the measurement development results for the TTM constructs provide sufficient evidence that the scales can be used with a Bulgarian adolescent population. This study can also be interpreted as a successful test for the cross-cultural validity of the TTM constructs of decisional balance and self-efficacy among Bulgarian adolescents.

In addition to the adaptation of the TTM scales, the validity of two stress scales was examined. Both the Rhode Island Stress and Coping Inventory (Fava et al., 1998) and the Perceived Stress Scale (Cohen et al., 1983) demonstrated good psychometric properties, even though for the PSS a two-factor structure instead of the original unifactorial one was retained. Thus the results of the current study can be interpreted as validation of these instruments for Bulgarian adolescents as well.

Factors associated with smoking behavior

A second line of research for the project was to explore the variables associated with smoking behavior among Bulgarian adolescents. The study was cross-sectional in nature and no causal relationship could be established, but since previous research with this population is virtually lacking the results reported here are an important first step towards a line of research facilitating the development of effective smoking prevention and cessation programs.

Smoking behavior was conceptualized in four different ways and used as an outcome variable in a series of analyses. Models with the following outcome variables were created: smokers vs. nonsmokers, ever smokers vs. never smokers, current smokers vs. quitters, nonsmokers at high risk for smoking initiation vs. nonsmokers at low risk for smoking initiation. The first two analyses used the entire sample of participants, but no TTM constructs. The second two models were performed only with participants in the relevant part of the sample, determined through a smoking status question (see Chapter 1) and included TTM variables. It was expected that some differentiation would exist between the factors that prevent students from ever trying a cigarette, put them at increased risk for smoking initiation, turn them into regular smokers and help them to quit the habit.

The exploratory work started under the main hypothesis that perceived levels of stress would be different for smokers and nonsmokers. The results failed to provide any evidence for this hypothesis (# 4) and thus no grounds were present to explore the next hypothesis (#5) on the modifying effect of coping skills.

Of the remaining factors, only attitudes towards smoking bans in public places emerged as an important variable related to the outcome across all four models. Since a single item was used to measure this construct, its reliability is low and this result needs to be interpreted with caution. The consistency of the finding however suggests that this relationship deserves further exploration using better measures (e.g., Laforge et al., 1998).

The number of smoking friends was a variable that was strongly related to smoking behavior in the first two models. When the self-efficacy construct was included as a predictor in the last two models, the number of smoking peers was not retained in the final solution. This finding suggests that even though friends' smoking is strongly related to smoking, this correlation could be moderated by good self-efficacy skills. This finding has important implications for the development of future interventions, since it shows a potential strategy to counteract the strong influence of peer pressures in teenage years.

Across all models some evidence was present for the importance of the influence of the smoking habits of other family members on the smoking behavior of the student. It seemed that the smoking behavior of the mother and the siblings is more important, perhaps reflecting higher prevalence or broader acceptance of smoking among fathers. Although the observed relationship was not very strong, it suggests that prevention programs targeting the whole family could be important.

In the models assessing readiness to quit and risk of smoking initiation it was expected that the relevant TTM constructs would be related to the outcomes, after controlling for demographics and attitudes. This expectation was only partially met. When readiness to quit smoking was assessed both with stage and binary outcomes

among smokers, only the Temptations scale was retained in the final model, while the Pros and Cons of smoking failed to add explanatory power to the model. Since the decisional balance measure was successfully validated and demonstrated the expected pattern across stages, the fact that the construct had lower explanatory power in a multivariate model can be explained with the smaller effect size. The TTM constructs performed better in analyses among nonsmokers when higher risk for smoking was explored. Both Temptations and Pros of staying smoke free were retained in the final model, supporting the importance of these variables in describing participants at increased risk for smoking initiation.

Finally, some variables assessing different attitudes and beliefs (smoking is harmful, hard to quit and leads to weight gain) related to smoking demonstrated strong relationships with smoking behavior in a number of the models. Since these variables were measured through single items and their presence was not consistent across the models, no further interpretation will be pursued here. It is worth pointing out though, that development and use of better measures for these constructs may be worthwhile. Doing so may be especially important and interesting in countries like Bulgaria where the public is just beginning the diffusion process of learning about the actual effects of smoking on health and where misperceptions about smoking may remain strong.

Comparison of logistic regression and discriminant function analysis

A secondary goal of the study was to compare the performance of logistic regression and discriminant function analysis for models with binary outcomes. Theoretical comparisons of these methods have been reported from a number of different points of view. For instance Efron (1975) compares the two methods of estimation when

the DFA assumptions are met and concludes that under these conditions for estimators of classification probabilities the DFA method is more efficient. However it has been pointed out that the assumptions of normality and equality of covariance matrixes are unrealistic and rarely hold true in practice (Hosmer & Lemeshow 2000; Hosmer et al., 1983; Press and Wilson, 1973) and the logistic regression presents a more robust procedure. In addition some bias increasing with the departure from equal prior probabilities has been reported for the DFA coefficients. For these reasons the logistic regression approach has been recommended.

In the current study applied comparison of the two methods was performed. The results suggested several conclusions:

1/ Both methods suggested identical variables to be included in the classification function.

2/ The overall classification rate for both methods was rather similar.

3/ The sensitivity results were poorer for the logistic regression procedure when equal prior probabilities were used. Further exploration indicated that the procedure is more sensitive to the differences in the sizes of the groups and the selected cutoff threshold.

The overall conclusion is that the choice of method should greatly depend on the available data, the goal of analysis, and the presence of information for the actual prevalence of the outcome of interest in the population.

When the assumptions of normality and equality of covariance matrixes are violated, logistic regression presents the more robust alternative. Logistic regression also seems to be the better choice when the goal is to assess the significance and importance

of each variable that differentiates between groups, since it provides both significance testing and effect size estimation for each variable included in the analysis. Selection of important predictors and determination of their effect sizes is much more complicated and arbitrary in DFA.

The results of the current study suggest that when the assumptions of DFA are met and the goal of the analysis is classification of cases the choice of method would depend on the groups' sample sizes and the ability to assign prior probabilities corresponding to the population prevalence. When the presence and absence condition are equally distributed, both methods would produce very similar results. More often however the presence is indicated by some rather rare condition and this group would have a much smaller sample size. In this case if population prevalence of the condition is known and is approximately correspondent to the sample sizes of the groups, prior probabilities can be estimated using this knowledge and logistic regression would be the more sensitive method. If, however, no knowledge of the population prevalence is available and a model with equal prior probabilities and very unequal sample sizes is created, DFA would be the more sensitive method. More definitive support for the accuracy of this recommendation should be explored in future simulation studies.

Limitations

This study has certain limitations. The rather small sample sizes used in the measurement development phase are a caveat of the measurement development procedure. In addition, the cross-sectional nature of the study does not allow for validation of the constructs or prediction of future behaviors. As already mentioned, the cross-sectional nature of the study also prohibits any predictive causal statements. Finally, the differences in the

psychometric properties of the included measures, with some constructs assessed through single items and others through full scales is a weakness.

Despite these limitations the study provides important information on the applicability of the TTM constructs for this Bulgarian sample and provides a basis for development of smoking cessation and potentially prevention interventions.

Future Directions

This project is a first and important step in a research program that can develop further in many directions. Some of the possible future steps include work with the same data used in the analyses described above. For instance, hierarchical multilevel modeling can be used as an alternative approach in order to take into account the fact that the data was collected in classrooms and thus the individual observations were correlated. Additional exploratory look at the data could use cluster analysis on the group of participants in maintenance for nonsmokers and precontemplation for smokers to assess their homogeneity. Finally the data and the measurement work from the currents study could be used to assess cultural invariance of the measures with a comparable sample of US adolescents.

An important step following this exploratory work would be the design and implementation of a study with a longitudinal design and larger sample sizes that will allow exploration of causal relationships between smoking and the variables outlined in this project as potential predictors. In future work better measures of attitudes towards smoking policies, marketing receptiveness and beliefs related to smoking need to be developed. For example, the smoking policy inventory would measure this construct better and has been used across different countries (Velicer et al., 1994; Laforge et al.,

1998). Cross-cultural design of such a project would allow for a number of interesting comparisons and shed light on similarities and differences of smoking initiation and cessation across cultures. The final goal of this line of research would be the development of effective interventions.

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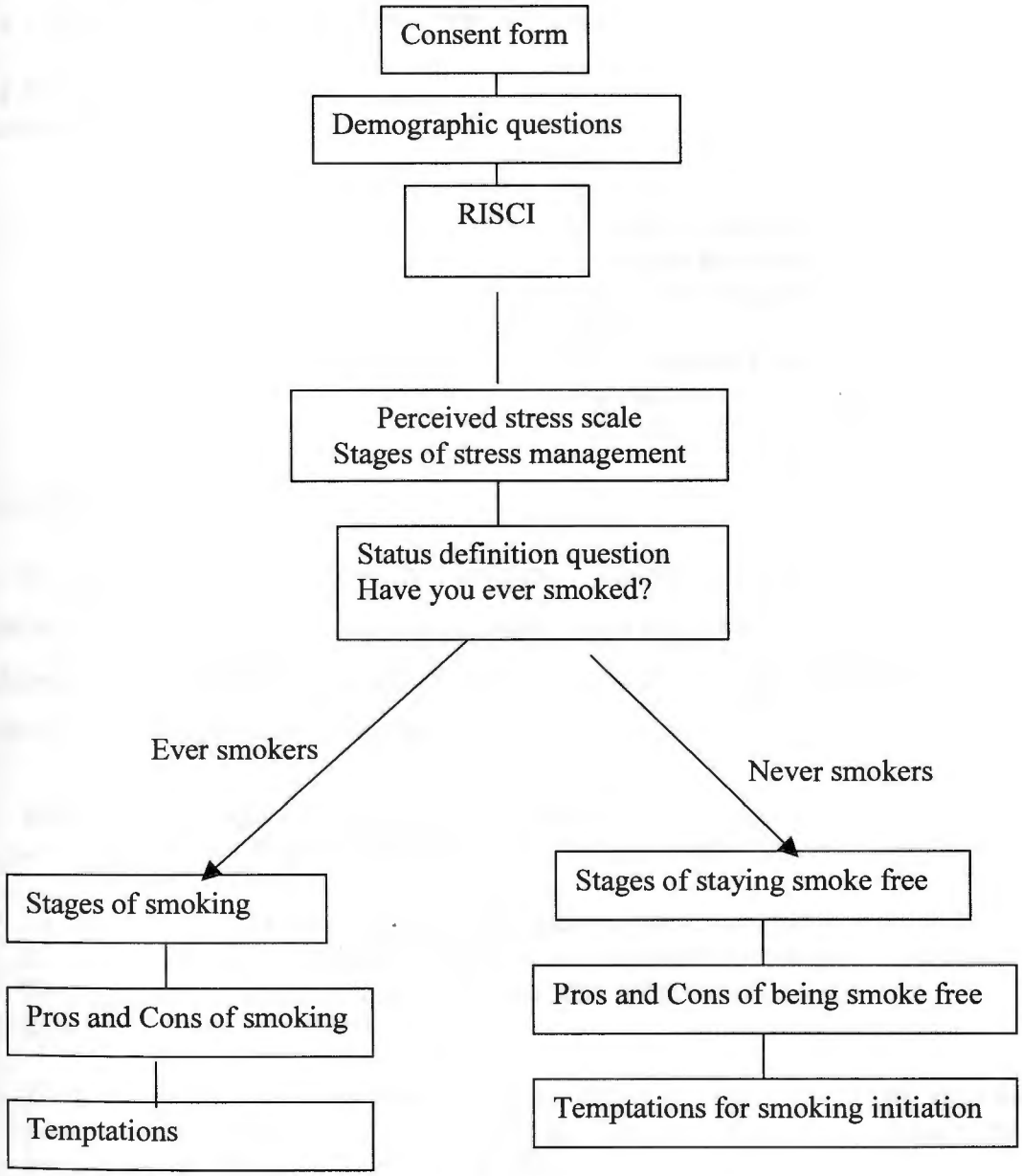
Appendices

Appendix A: Organization of survey battery



Appendix B: Letter of approval from Bulgarian Ministry of Education /translation/

REPUBLIC OF BULGARIA
MINISTRY OF EDUCATION AND SCIENCE
Sofia – 1000, bul. "Kniaz Dondukov" 2A, tel. 9217, fax. 988 24 85

Issue # 43906/31 October 2002
/translation/

To:
Colleen A. Redding, Ph.D.
Associate Research Professor
Cancer Prevention Research Center
Department of Psychology,
University of Rhode Island
CC: Milena D. Anatchkova

Dear Ms. Redding,

In response to your letter to the Ministry of Education and Science and a request submitted by Milena Anatchkova, regarding a dissertation research study "Smoking and stress: Exploring patterns among high school youth in Bulgaria" we are hereby informing you the following:

1. We approve the data collection for the above-mentioned study for a sample of 600 students in 9th to 12th grade in the high schools in the cities of Sofia and Plovdiv.

2. As an institution we are interested in the results of this study and would expect to receive a report of the findings of the analysis conducted by Milena Anatchkova. This would allow us to compare the results with other data on the smoking patterns of youth in Bulgaria.

3. The specific time for data collection will need to be arranged individually with the principals of participating schools according to the curriculum in each school and the willingness of the students to participate.

Sincerely: **/Signature/**
Julian Nakov
Vice Minister of Education

Appendix C: Student consent form

The University of Rhode Island
Department of Psychology
Address
Title of Project

CONSENT FORM FOR RESEARCH

You have been asked to take part in a research project described below. You should feel free to ask questions. If you have more questions later, contact Milena Anatchkova, the person mainly responsible for this study at mana8938@postoffice.uri.edu or tel. 71-04-09.

You have been asked to take part in that survey looking to describe smoking behavior and attitudes among adolescents in Bulgaria. If you decide to take part in this study you will be asked to answer a number of questions about your attitudes towards smoking. The whole survey usually takes about 20 minutes to fill out.

The study will be completely anonymous and confidential. This means that you will not be asked your name or any information through which your answers could later be linked to you. You will return your answers in a sealed envelope, provided with the questionnaire. The main investigator will store all the data in confidentiality.

Although there will be no direct benefit to you for taking part in this study, the researcher may learn more about the factors that lead to smoking initiation and that prevent adolescents from quitting smoking. There is no potential risk for you involved in this study.

If this study causes you any injury or if you are not satisfied with the way the study is performed you should write or call the office of the Vice Provost for Graduate Studies, Research and Outreach, 70 Lower College Road, University of Rhode Island, Kingston, Rhode Island, telephone: (401) 874-4328. In addition you may discuss your complaints with the supervisor of this project Dr. Colleen Redding (401) 874 – 4316.

Although your participation will be greatly appreciated the decision to take part in this study is up to you. If you decide to take part in the study, you may quit at any time. Whatever you decide will in no way affect your grade or status as a student.

By completing this survey you indicate that you have read the consent form, you understand your involvement in this study and you agree to participate.

Appendix D: Student consent form in Bulgarian

Университет на Роуд Айлънд
Факултет по психология

Формуляр за съгласие за участие

Днес сте помолен/а да вземета участие в изследването, описано тук. Моля, прочетете внимателно това описание и ако имате въпроси свободно ги задайте. Ако въпроси възникант по-късно, моля свържете се с Милена Аначкова, организаторът на това исзледване на телефон 71-04-09 или на е-майл: mana8938@postoffice.uri.edu.

Целта на настоящето изследване е да се опита да регистрира и опише нагласите на тийнейджърите в България към тютюнопушенето. Ако решите да вземете участие в това изследване, просто ще Ви помоля да отговорите на въпросите от една анкета. Попълването на анктетата отнема около 20 минути.
Участието в исзледването е напълно поверително и анонимно. Това означава, че няма да бъдете запитвани за Вашето име и анкетата не съдържа никаква информация, чрез която отговорите да бъдат свързани с Вас. След попълването на анкетата ще я върнете на анкетиора запечатана в плик, които ще Ви бъде предоставен. Всички данни ще бъдат съхранявани от организатора на изследването и няма да бъдат предоставяни на трети лица.
Въпреки, че личната полза от попълването на тази анкета лично за Вас е минималма, изследването ще помогне по-добре да бъдат разбрани факторите, които карат тийнеиджърите да започнат да пушат и се явяват пречка при техните опити да откажат цигарите.
Ако това изследване Ви причини някакво неудобство или сте неудовлетворен от начина, по който изследването се провежда, можете да се обърнете за съдеиствие към Маргарита Боева, суперваизора на този проект за България на телефон: 962 1225 Също така можете да се свържете със следния офис: Vice Provost for Graduate Studies, Research and Outreach, 70 Lower College Road, University of Rhode Island, Kingston, Rhode Island, телефон: (401) 874-4328. Също така можете да обсъдите притесненията си със суперваизора на това исзледване Д-р. Колин Рединг на телефон (401) 874-4316.
Вашето участие ще бъде дълбоко оценено, но краиното решение да вземете уяастие е изцяло Ваше. Каквото и да е това решение, то няма по никакъв начин да се отрази на успеха или статуса Ви в училище.
С попълването на тази анкета Вие удостоверявате, че сте прочели описанието на изследването и давате съгласието си за участие.

Благодаря!

Appendix E: Survey battery in English

Demographic form

1. **Age: _____years**
2. **Gender:** ☐ Male ☐ Female
3. **Grade:** ☐ 8th ☐9th ☐ 10th ☐11th ☐12th
4. **What is your ethnic group?:_____**
5. **What was your GPA during the last semester?**
   - ☐ Excellent
   - ☐ Very good
   - ☐ Good
   - ☐ Poor
6. **Which of the following best describes your plans for the future (after school graduation)?**
   - ☐ I will apply to college
   - ☐ I will start working
   - ☐ I will apply to universities in foreign countries
   - ☐ I will join the army
   - ☐ I don't know
7. **What is the highest degree of education for your father?**
   (Multiple choice of Bulgarian educational levels)
8. **What is the highest degree of education for your mother?**
   (Multiple choice of Bulgarian educational levels)
9. **What is the average amount of pocket money you have per day? _____**leva
10. **Your Birth date: _____.**
11. **Does any of your siblings smoke?**
    ☐ I don't have any siblings ☐ Yes ☐ No
12. **How many of your close friends smoke cigarettes?**
    - ☐ None
    - ☐ One
    - ☐ A few
    - ☐ Most of my close friends
13. **Do your parents smoke?**
    - ☐ None of my parents smokes
    - ☐ Only my father
    - ☐ Only my mother
    - ☐ Both
14. **Is smoking allowed in you house?**
    ☐ **Yes** ☐ **No**

Perceived stress scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

In the last month how often have you...?	Never 1	Almost never 2	Sometimes 3	Fairly often 4	Very often 5
1.... been upset of something that happened unexpectedly?	☐	☐	☐	☐	☐
2.... felt that you were unable to control the important things in your life?	☐	☐	☐	☐	☐
3.... felt nervous and stressed?	☐	☐	☐	☐	☐
4.... dealt successfully with irritating life hassles?	☐	☐	☐	☐	☐
5.... felt that you were effectively coping with important changes that were occurring in your life?	☐	☐	☐	☐	☐
6.... felt confident about your ability to handle your personal problems?	☐	☐	☐	☐	☐
7.... felt that things were going your way?	☐	☐	☐	☐	☐
8.... found that you could not cope with all the things that you had to do?	☐	☐	☐	☐	☐
9.... been able to control irritations in your life?	☐	☐	☐	☐	☐
10....felt that you were on top of things?	☐	☐	☐	☐	☐
11... been angered because of things that happened that were outside of your control?	☐	☐	☐	☐	☐
12....found yourself thinking about things that you have to accomplish?	☐	☐	☐	☐	☐
13... been able to control the way you spend your time?	☐	☐	☐	☐	☐
14.... felt difficulties were piling up so high that you could not overcome them?	☐	☐	☐	☐	☐

Rhode Island Stress and Coping Inventory (RISCI)

In the last month, how often was each of the following statements true of your own life?

How often …?	Never 1	Seldom 2	Occasionally 3	Often 4	Repeatedly 5
1. I was able to cope with difficult situations.	☐	☐	☐	☐	☐
2. I felt overwhelmed.	☐	☐	☐	☐	☐
3. I was able to cope with unexpected problems.	☐	☐	☐	☐	☐
4. I felt stressed by unexpected events.	☐	☐	☐	☐	☐
5. I successfully solved problems that came up.	☐	☐	☐	☐	☐
6. I felt I had more stress than usual.	☐	☐	☐	☐	☐
7. I felt able to cope with stress.	☐	☐	☐	☐	☐
8. I felt there was not enough time to complete my daily tasks.	☐	☐	☐	☐	☐
9. I felt able to meet demands.	☐	☐	☐	☐	☐
10. I was pressured by others.	☐	☐	☐	☐	☐

Family Influence

How often in the past 30 days has your family done the following?

How often …?	Almost never 1	Once in a while 2	Occasionally 3	Often 4	Repeatedly 5
1. Encourage each other to stay away from cigarettes.	☐	☐	☐	☐	☐
2. Discuss how smoking is unhealthy.	☐	☐	☐	☐	☐
3. Remind each other to avoid cigarette smoking.	☐	☐	☐	☐	☐
4. Share ideas on how to stay a nonsmoker or quit cigarettes.	☐	☐	☐	☐	☐
5. Discuss consequences of smoking.	☐	☐	☐	☐	☐
6. Establish rules regarding smoking in the house.	☐	☐	☐	☐	☐

Staging Algorithm for stress management

Stress often comes from having to manage changes or challenges in your life. Sometimes these stresses are negative, like having disagreements with family or friends. Sometimes they are positive, like taking a vacation. Managing your stress can help you find the right balance. This is somewhere between just enough stress to keep you challenged, but not so much that it slows you down or makes you feel bad. When you find the right balance this is a sign that you are successfully managing your stress. There are many different things you can do to keep stress under control. People who are good at managing their stress do things every day to maintain a healthy balance. Some of the most common ways to manage stress are:

- Talking with others about your problems
- Making time for social activities
- Having regular quiet time to reflect on your daily activities
- Listening to relaxing music
- Doing regular physical activity

Please answer the following questions. Mark the box in front of your response.

1. In the last year, have you tried at least once to spend time each day practicing stress management.

☐Yes ☐ No

2. About how many minutes do you spend each day practicing stress management?

☐ 0
☐ 1 to 15
☐ 16 to 30
☐ 31 to 60
☐ more than 60

Practicing **effective** stress management means that you successfully deal with the stress in your daily life.

3. Do you practice **effective** stress management in your daily life?

☐Yes ***☐No***

4. Have you practiced **effective** stress management for more than 6 months?

☐Yes ☐ No

5. Do you intend to practice **effective** stress management in the next 6 months?

☐Yes ☐ No

6. Do you intend to practice **effective** stress management in the next 30 days?

☐Yes ☐ No

Media exposure to smoking messages and attitudes to smoking questions

1. During the past 30 days (one month), how many anti-smoking media messages (e.g. television, radio, billboards, posters, newspapers, magazines, movies) have you seen?

- ☐ Quite a lot (more than 50)
- ☐ A lot (more than 30)
- ☐ Some (15 - 30)
- ☐ A few (Less than 15)
- ☐ None

2. When you go to sports events, fairs, concerts, community events, or social gatherings, how often do you see anti-smoking messages?

- ☐ Almost all the time
- ☐ A lot
- ☐ Sometimes
- ☐ Rarely
- ☐ Never

3. During the past 30 days (one month), how many cigarette commercials have you seen in the media (e.g., television, radio, billboards, posters, newspapers, magazines, movies)?

- ☐ Quite a lot (more than 50)
- ☐ A lot (more than 30)
- ☐ Some (15 - 30)
- ☐ A few (Less than 15)
- ☐ None

4. When you go to sports events, fairs, concerts, or community events, how often do you see advertisements for cigarettes?

- ☐ Almost all the time
- ☐ A lot
- ☐ Sometimes
- ☐ Rarely
- ☐ Never

5. Do you have something (t-shirt, pen, backpack, etc.) with a cigarette brand logo on it?

- ☐ Yes, a whole collection
- ☐ Yes, quite a few items
- ☐ Yes, some items
- ☐ Yes, but only one or two items
- ☐ No, I don't have any

6. Has a (cigarette representative) ever offered you a free cigarette?

☐ Yes ☐ No

7. Do you think that smoking cigarettes makes you gain or lose weight?

☐ Gain weight ☐ Lose weight ☐ No difference

8. Do you think cigarette smoking is harmful to your health?

- ☐ Definitely not
- ☐ Probably not
- ☐ Probably yes
- ☐ Definitely yes

9. Once someone has started smoking, do you think it would be difficult to quit?

- ☐ Definitely not
- ☐ Probably not
- ☐ Probably yes
- ☐ Definitely yes

10. Are you in favor of banning smoking in public places?

- ☐ Definitely not
- ☐ Probably not
- ☐ Probably yes
- ☐ Definitely yes

Smoking status and staging algorithm for smoking acquisition

11. Have you *ever* smoked cigarettes?

a. No, I have never tried smoking.
b. Yes, but less than one cigarette.
c. Yes, but only 1 or 2 cigarettes.
d. Yes, but not weekly.
e. Yes, weekly.
f. I used to smoke but I quit.

12. Which of the following best describes your *current* cigarette smoking?

a. I have **never** smoked cigarettes (GO TO PAGE 7) *Acquisition*
b. I have **tried** smoking a few times (GO TO PAGE 7) *Acquisition*
c. I used to smoke **weekly or more** but I quit (GO TO PAGE 10) *Cessation*
d. I am a **smoker** (GO TO PAGE 10) *Cessation*

Staging for smoking acquisition

SmA

1. Will you ever smoke in the future?

☐ Yes ☐ No

2. Have you made a decision or commitment to not smoke in the future?

☐ Yes ☐ No

3. For how long has your decision or commitment been made to not smoke in the future?

a. I have NOT made this decision or commitment.
b. I made this decision or commitment LESS than 6 months ago.
c. I made this decision or commitment MORE than 6 months ago.
d. I have always made this decision or commitment.

4. Do you intend to make a decision or commitment to not smoke in the future?

a. No
b. Yes, I am thinking about making this decision or commitment in the next year.
c. Yes, I am thinking about making this decision or commitment in the next 6 months.
d. Yes, I plan to make this decision or commitment in the next 30 days.
e. Yes, I already made this decision or commitment.

5. Do you think that you will ever try smoking in the future?

☐ Yes ☐ No

6. How sure are you that you will not try smoking in the *next 6 months*?

a. Very sure
b. Quite sure
c. Hard to say
d. Somewhat unsure
e. Quite unsure

Temptation Acquisitions (TMPTA)

How tempted would you be to try smoking in each of these situations?

How tempted are YOU to try smoking…?	Not at all tempted 1	Not very tempted 2	Somewhat tempted 3	Very tempted 4	Extremely tempted 5
1. When things are not going my way and I am frustrated.	☐	☐	☐	☐	☐
2. While talking and relaxing.	☐	☐	☐	☐	☐
3. With friends at a party.	☐	☐	☐	☐	☐
4. When others are talking about how much they like smoking.	☐	☐	☐	☐	☐
5. When I am afraid I might gain weight.	☐	☐	☐	☐	☐
6. When I am very anxious and stressed.	☐	☐	☐	☐	☐
7. When I am having a good time.	☐	☐	☐	☐	☐
8. When I want to be part of the crowd.	☐	☐	☐	☐	☐
9. When I want to know how a cigarette tastes.	☐	☐	☐	☐	☐
10. When I want to get thinner.	☐	☐	☐	☐	☐
11. When I want to be taken seriously.	☐	☐	☐	☐	☐
12. When I want to look mature.	☐	☐	☐	☐	☐
13. When I want to show my independence.	☐	☐	☐	☐	☐
14. When I want to make an acquaintance and don't know how to start.	☐	☐	☐	☐	☐
15. When I am too worried about an exam at school.	☐	☐	☐	☐	☐
16. When my friends want me to try a cigarette.	☐	☐	☐	☐	☐
17. When somebody I am attracted to smokes cigarettes.	☐	☐	☐	☐	☐

Decisional Balance Acquisition (DBA)

Here are some opinions about choosing not to smoke. Read each one carefully. Then, rate **HOW IMPORTANT** each one is TO YOU in your choice to stay smoke free or not. Only you can say what's important to you about not smoking. There are no right or wrong answers.

How important to YOU is…?	Not Important 1	Slightly Important 2	Somewhat Important 3	Very Important 4	Extremely Important 5
1. I will get into less trouble if I don't smoke.	☐	☐	☐	☐	☐
2. My social life will suffer if I don't smoke.	☐	☐	☐	☐	☐
3. Physical activities would be easier for me I if I don't smoke.	☐	☐	☐	☐	☐
4. I will feel uncomfortable at parties if I don't smoke.	☐	☐	☐	☐	☐
5. I'll stay healthier if I don't smoke.	☐	☐	☐	☐	☐
6. I won't fit in with people who matter to me if I don't smoke.	☐	☐	☐	☐	☐
7. I'll keep the air cleaner for everyone if I don't smoke.	☐	☐	☐	☐	☐
8. I will have fewer friends if I don't smoke.	☐	☐	☐	☐	☐
9. I'll be more attractive without smoking.	☐	☐	☐	☐	☐
10. I will have trouble coping with problems without smoking.	☐	☐	☐	☐	☐
11. I will be a better role model if I don't smoke.	☐	☐	☐	☐	☐
12. I will feel anxious without smoking.	☐	☐	☐	☐	☐
13. I will show people that you can be "cool" without smoking.	☐	☐	☐	☐	☐
14. I will feel less like an adult if I don't smoke.	☐	☐	☐	☐	☐
15. I'll do better in school without smoking.	☐	☐	☐	☐	☐
16. If I don't smoke, I will miss out on an important experience.	☐	☐	☐	☐	☐
17. I will have less trouble with my family without smoking.	☐	☐	☐	☐	☐
18. I will be tenser without smoking.	☐	☐	☐	☐	☐
19. I'll do better in sports if I don't smoke.	☐	☐	☐	☐	☐
20. Smoking would help me to calm down.	☐	☐	☐	☐	☐
21. My parents would be proud of my choice not to smoke.	☐	☐	☐	☐	☐
22. Smoking would help me deal with problems.	☐	☐	☐	☐	☐
23. I will be healthier if I don't smoke.	☐	☐	☐	☐	☐

Staging algorithm for readiness to quit smoking

SmC

1. Have you *completely* stopped smoking cigarettes?

- ☐ Yes, more than 12 months ago.
- ☐ Yes, 6 to 12 months ago.
- ☐ Yes, 4 to 6 months ago.
- ☐ Yes, during the last 3 months.
- ☐ No, I smoke now.

2. How many cigarettes did you smoke in the *last 24 hours*? _____

3. How often did you smoke cigarettes during the *past 30 days*?

- ☐ Not at all
- ☐ Less than one cigarette per day
- ☐ 1 to 5 cigarettes per day
- ☐ About half a pack (10 cigarettes) per day
- ☐ About one (1) pack per day
- ☐ About one and a half (1+) packs a day
- ☐ 2 packs or more per day

4. Have you quit smoking for at least 24 hours in the past year?

☐ Yes ☐ No

5. Are you seriously thinking about quitting within the next 6 months?

☐ Yes ☐ No

6. Are you planning to quit smoking in the next 30 days?

☐ Yes ☐ No

Temptations Cessation (TMPTC)

How tempted would you be to smoke in each of these situations?

How tempted are YOU to smoke ...?	Not at all tempted 1		Not very tempted 2		Somewhat tempted 3		Very tempted 4		Extremely tempted 5	
1. When I'm very angry about something or someone.	☐		☐		☐		☐		☐	
2. When my friends offer me a cigarette.	☐		☐		☐		☐		☐	
3. When I feel I need a lift.	☐		☐		☐		☐		☐	
4. When I am afraid I might gain weight.	☐		☐		☐		☐		☐	
5. When things are not going my way and I'm frustrated.	☐		☐		☐		☐		☐	
6. When it is difficult to refuse a cigarette.	☐		☐		☐		☐		☐	
7. When I realize I haven't smoked for a while.	☐		☐		☐		☐		☐	
8. When I want to get thinner.	☐		☐		☐		☐		☐	
9. With my morning cup of coffee.	☐		☐		☐		☐		☐	
10. When I'm craving a cigarette.	☐		☐		☐		☐		☐	
11. When I'm having fun at a party.	☐		☐		☐		☐		☐	
12. When everybody around me smokes.	☐		☐		☐		☐		☐	
13. When I'm bored.	☐		☐		☐		☐		☐	
14. When I have to study for a test.	☐		☐		☐		☐		☐	
15. When I'm waiting for someone or somebody too long.	☐		☐		☐		☐		☐	
16. When something irritates me.	☐		☐		☐		☐		☐	
17. When I want to eat less.	☐		☐		☐		☐		☐	

Decisional Balance Cessation (DBC)

Here are some opinions about smoking. Read each one carefully. Then, rate **HOW IMPORTANT** each one is in your choice to smoke or not smoke. Only you can say what's important to you about smoking. There are no right or wrong answers.

How important to YOU is...?	Not Important 1	Slightly Important 2	Somewhat Important 3	Very Important 4	Extremely Important 5
1. Smoking makes kids get more respect from others.	☐	☐	☐	☐	☐
2. Smoking gives my breath, hair and clothes a bad odor.	☐	☐	☐	☐	☐
3. Kids who smoke have more friends.	☐	☐	☐	☐	☐
4. Smoking can affect the health of others.	☐	☐	☐	☐	☐
5. Smoking helps people to cope better with frustrations.	☐	☐	☐	☐	☐
6. Smoking cigarettes is hazardous to people's health.	☐	☐	☐	☐	☐
7. Smoking cigarettes is pleasurable.	☐	☐	☐	☐	☐
8. Cigarette smoke bothers other people.	☐	☐	☐	☐	☐
9. Smoking cigarettes relieves tension.	☐	☐	☐	☐	☐
10. Smoking is a messy habit.	☐	☐	☐	☐	☐
11. Kids who smoke go out on more dates.	☐	☐	☐	☐	☐
12. Smoking makes teeth yellow.	☐	☐	☐	☐	☐
13. People who smoke look more mature.	☐	☐	☐	☐	☐
14. Smoking makes people sick.	☐	☐	☐	☐	☐
15. Kids who smoke have more fun.	☐	☐	☐	☐	☐
16. Smoking is an expensive habit.	☐	☐	☐	☐	☐
17. Smoking a cigarette makes it easier to handle bad moments.	☐	☐	☐	☐	☐
18. Smoking can get me into trouble with my parents.	☐	☐	☐	☐	☐
19. Kids who smoke go out more.	☐	☐	☐	☐	☐
20. Smoking is not "cool" anymore	☐	☐	☐	☐	☐
21. It's easier to meet new people if you smoke.	☐	☐	☐	☐	☐
22. Smoking ruins the skin of my face.	☐	☐	☐	☐	☐
23. Smoking helps me to reduce my appetite.	☐	☐	☐	☐	☐

Appendix F: Survey battery in Bulgarian

Demographic form in Bulgarian

1. **Възраст:_____ години**

2. **Пол:___ ☐ М ☐ Ж**

3. **Клас:** ☐ 8ми ☐9ти ☐ 10ти ☐11ти ☐12ти

4. **С приблизително какъв успех завърши миналия срок в училище?**
   - ☐ Отличен
   - ☐ Много добър
   - ☐ Добър
   - ☐ Слаб

5. **Коя от следните възможности най-добре отговаря на твоите планове за бъдещето?**
   - ☐ Ще кандидатсвам в университет
   - ☐ Ще започна работа
   - ☐ Ще кандидатствам в университети в чужбина
   - ☐ Ще отида в казармата
   - ☐ Нямам конкретни планове

6. **Какво е образованието на баща ти?**
   - ☐ Висше ☐ Средно
   - ☐ Полувисше ☐ Под средно
   - ☐ Средно специално ☐ Не знам

7. **Какво е образованието на майка ти?**
   - ☐ Висше ☐ Средно
   - ☐ Полувисше ☐ Под средно
   - ☐ Средно специално ☐ Не знам

8. **Средно по колко пари на ден получаваш като джобни?____лева**

9. **Дата на ражадане _____**

10. **Някои от братята/ сестрите ли пуши ли?**
    - ☐ Нямам брат нито сестра ☐ Да ☐ Не

11. **Колко от близките ти приятели пушат?**
    - ☐ Никой от приятелите ми не пуши
    - ☐ Един-двама
    - ☐ Около половината
    - ☐ Повечето ми приятели пушат

11. **Родителите ти пушат ли?**
    - ☐ Не
    - ☐ Само баща ми пуши
    - ☐ Само маика ми пуши
    - ☐ И двамата пушат

12. **У вас разрешено ли е да се пуши?**
    - ☐ Да ☐ Не

PSS in Bulgarian

Въпросите по долу се отнасят до твоите мисли и чувства през последния месец. Във всички въпроси ти трябва да посочиш колко често си се чувствал/а по определен начин. Някои от въпросите са много сходни, но въпреки това е важно да отговориш на всеки въпрос по отделно. Най-добрият подход е да отговориш на всички въпроси сравнително бързо, като просто се опиташ да посочиш приблизителен отговор.

Колко често през последния месец…?	**Никога 1**	**Почти никога 2**	**Понякога 3**	**Често 4**	**Много често 5**
1. … се чувствах подтиснат от неочаквани събития?	☐	☐	☐	☐	☐
2.… усещах, че не съм в състояние да контролирам важни събития в живота си?	☐	☐	☐	☐	☐
3.… се чувствах нервен/а и напрегнат/а?	☐	☐	☐	☐	☐
4.… се справих успешно с дразнещи житейски неприятности?	☐	☐	☐	☐	☐
5. … имах усещането, че се справям успешно с важни промени настъпващи в живота ми?	☐	☐	☐	☐	☐
6.… имах усещането, че мога сам да се справя с личните си проблеми?	☐	☐	☐	☐	☐
7.… нещата се развиваха по желан от мен начин?	☐	☐	☐	☐	☐
8.… имах чувството, че не мога да се справя с всички неща които трябва да свърша?	☐	☐	☐	☐	☐
9.… бях в състояние да контролирам дразнещите неща около мен?	☐	☐	☐	☐	☐
10.… имах усещането, че контролирам успешно живота си?	☐	☐	☐	☐	☐
11… се ядосвах на неща, които са извън моя контрол?	☐	☐	☐	☐	☐
12.… улавях се да мисля за неща, които трябва да свърша?	☐	☐	☐	☐	☐
13… бях в състояние да избирам начина, по който прекарвам времето си?	☐	☐	☐	☐	☐
14.… имах усещането, че проблемите се трупат толкова бързо, че не мога да се справя с тях?	☐	☐	☐	☐	☐

RISCI in Bulgarian

Помисли си за последния месец и посочи колко често всяко от следните твърдения е вярно за теб?

Колко често…?	Никога 1	Рядко 2	Понякога 3	Често 4	Постоянно 5
1. Успешно се справях с трудни ситуации.	☐	☐	☐	☐	☐
2. Чувствах че имам твърде много задачи и задължения.	☐	☐	☐	☐	☐
3. Справях се успешно с неочаквани проблеми.	☐	☐	☐	☐	☐
4. Неочаквани събития ме караха да се чувствам напрегнат/а.	☐	☐	☐	☐	☐
5. Успешно се справях с новопоявили се проблеми.	☐	☐	☐	☐	☐
6. Усещах, че съм под по-голям стрес от обикновено.	☐	☐	☐	☐	☐
7. Чувствх, че съм в състояние да се справя със стреса.	☐	☐	☐	☐	☐
8. Нямах достатъчно време да свърша ежедневните си задачи.	☐	☐	☐	☐	☐
9. Усещах сили да се справя с предизвикателства.	☐	☐	☐	☐	☐
10. Околните ме притесняваха с изискванията си.	☐	☐	☐	☐	☐

Family influence scale in Bulgarian

Колко често през последните 30 дни в семейството ти се е случило нещо от следните неща:

Колко често…?	Почти никога 1	Отвреме на време 2	Понякога 3	Често 4	Постоянно 5
1. Помагали сте си един на друг да откажете цигарите.	☐	☐	☐	☐	☐
2. Обсъждали сте вредата от пушенето на цигари.	☐	☐	☐	☐	☐
3. Напомняли сте си да избягвате цигарите	☐	☐	☐	☐	☐
4. Споделяли сте идеи как се откажат цигарите или да остане човек непушач.	☐	☐	☐	☐	☐
5. Обсъждали сте последиците от тютюнопушенето.	☐	☐	☐	☐	☐
6. Обсъждали сте правила за пушенето на цигари в къщи.	☐	☐	☐	☐	☐

Stages of effective stress management in Bulgarian

Стресът обикновено е резултат от промени и предизвикателства в ежедневния живот. Понякога тези събития могат да бъдат неприятни, като недоразумения със семейството и приятелите. Но понякога дори и приятни събития водят до усещането за стрес, като например планирането на ваканция.
Важно е за всеки човек да открие начин по-които да се справя успешно с тези промени и да поддържа добър баланс. Добър баланс може да се определи като състоянието в което в живота ти има достатъчно предизвикателства, които те движат напред, без да водят до неприятно усещане за напрежение. Наличието на такъв балас е признак за успешно справяне със стреса.
Има много различни начини, които помагат да се контролира стреса и хората, които успешно се справят със стрес обикновено ежедневно практикуват някои от тези неща. Някои от най-често използваните стратегии са следните:

- Разговори с близки и познати за възникнали проблеми
- Отделяне на достатъчно време за срещи с приятели
- Наличието на определно време, за самостоятелен размисъл и/или медитация
- Слушане на успокояваща музика
- Редовни спортни занимания

След това кратко пояснение моля отговори на следните въпроси.

1. През последната година опитал ли си поне веднъж да направиш нещо, за да се справиш със стреса?

☐ Да ☐ Не

2. По колко минути на ден посвещаваш на дейности, които ти помагат да се справяш със стреса?

☐ 0
☐ 1 to 15
☐ 16 to 30
☐ 31 to 60
☐ повече от 60

Ефективен стрес мениджмент е всяка дейност която ти помага да преодолееш стреса в ежедневния си живот.

3. Правиш ли ежедневни усилия за ефективен стрес мениджмент?

☐***Yes*** ☐***No***

4. Занимавал ли си се с ефективен стрес мениджмент повече от 6 месеца?

☐Yes ☐ No

5. Имаш ли намерение да започнеш да полагаш усилия за ефективен стрес мениджмент в близките 6 месеца?

☐Yes ☐ No

6. **Имаш ли намерение да започнеш да полагаш усилия за ефективен стрес мениджмент в близките 30 дни?**

☐Yes ☐ No

Media exposure to smoking messages and attitudes to smoking questions
IN BULGARIAN

1. Приблизитено колко медиини съобщения насочени срещу тютюнопушенето (по тевизия, радио, вестници, списания, кино, плакати и билбордове) си видял през последния месец?

☐ Изключително много (повече от 50)
☐ Много (повече от 30)
☐ Няколко (15 - 30)
☐ Малко (по-малко от 15)
☐ Нито едно

2. Когато ходиш по клубове, дискотеки, спортни мероприятия и концерти колко често се случва да видиш реклама против тютютнопушенето?

☐ Навсякъде има такива реклами
☐ Често
☐ Понякога
☐ Рядко
☐ Никога

2. А приблизитено колко реклами за цигари (по тевизия, радио, вестници, списания, кино, плакати и биллбордове) си видял през последния месец?

☐ Изключително много (повече от 50)
☐ Много (повече от 30)
☐ Няколко (15 - 30)
☐ Малко (по-малко от 15)
☐ Нито една

4. Когато ходиш по клубове, дискотеки, спортни мероприятия и концерти колко често се случва да видиш реклама за цигари?

☐ Навсякъде има такива реклами
☐ Често
☐ Понякога
☐ Рядко
☐ Никога

5. Имаш ли някакъв сувенир (тениска, ключодържател, химикалка, раница и т.н.) с марката на производител на цигари?

☐ Да, имам цяла колекция
☐ Да, имам доста такива материали
☐ Да, имам няколко неща
☐ Може би имам едно две неща
☐ Не, нямам

6. Случвало ли се е рекламен агент да ти предложи безплатни цигари (например в клуб по време на промоция)?

☐ Да ☐ Не

7. Мислиш ли че пушенето помага да се контролира теглото?

- ☐ Да мисля че цигарите помагат да се отслабне
- ☐ Да мисля че цигарите водят до напълняване
- ☐ Не, мисля че нямат такъв ефект.

8. Мислиш ли че пушенето на цигари е вредно за здравето?

- ☐ Категорично не
- ☐ По-скоро не
- ☐ По-скоро да
- ☐ Категорично да

9. След като веднъж някои пропуши, мислиш ли че е трудно да се откажат цигарите?

- ☐ Категорично не
- ☐ По-скоро не
- ☐ По-скоро да
- ☐ Категорично да

10. Мислиш ли, че пушенето на обществени места трябва да бъде забранено?

- ☐ Категорично не
- ☐ По-скоро не
- ☐ По-скоро да
- ☐ Категорично да

Smoking status and staging algorithm for smoking acquisition in Bulgarian

SmSt

11. Пушил ли си някога цигари?

- ☐ Не, никога не съм палил
- ☐ Да, опитвал съм да пуша, но само едно две дръпвания
- ☐ Да, но само няколко дръпвания
- ☐ Да, опитвал съм няколко пъти
- ☐ Да, пушил съм, но не съм редовен пушач
- ☐ Да, пуша редовно
- ☐ Да, пушил съм, но отказа цигарите

12. Кое от следните твътдения най-добре описва сегашното ти поведение?

- ☐ Никога не съм пушил цигари (Отиди на страница от въпросника)
- ☐ Опитвал съм да пуша, но само няколко пъти няколко пъти (Отиди страница от въпросника)
- ☐ Известно време пушех поне веднъж седмично, но отказах цигарите (Отиди страница от въпросника)
- ☐ Пуша редовно (Отиди на страница от въпросника)

SmA

1. **Мислиш ли, че някога ще започнеш да пушиш?**
   ☐ Да ☐ Не
2. **Взел ли си сериозно решение никога да не запалиш цигара?**
   ☐ Да ☐ Не
3. **Кога реши, че никога няма да запалиш циагар?**
   - ☐ Не съм взел подобно решение
   - ☐ Преди по-малко от 6 месеца
   - ☐ Преди повече от 6 месеца
   - ☐ Винаги съм бил убеден че няма да запаля цигара
4. **Имаш ли намерение да вземеш твърдо решение да не пушиш?**
   - ☐ Не
   - ☐ Да, мисля че ще взема това решение през следващата година
   - ☐ Да, мисля че ще взема това решение през следващите 6 месеца
   - ☐ Да, мисля че ще взема това решение през следващите 30 дни
   - ☐ Вече съм взел това решение
5. **Мислиш ли че някога ще опиташ да пропушиш в бъдеще?**
   ☐ Да ☐ Не
6. **До колко си сигурен че няма да пропушиш в бъдеше?**
   - ☐ Напълно съм убеден
   - ☐ Доста съм уверен
   - ☐ Трудно е да се каже
   - ☐ Малко се съмнявам
   - ☐ Доста съм несигурен

TMPTA in Bulgarian

Различни хора се чувстват изкушени да запалят цигара в определени ситуации. Някой от тях са изброени тук. Моля, посочи доколко се чувстваш изкушен да запалиш цигара за всяка от посочените ситуации?

Доколко ТИ лично си изкушен да опиташ да запалиш цигара...?	**Изобщо не съм изкушен 1**	**Не съм много изкушен 2**	**Изкушен съм в известна степен 3**	**Доста съм изкушен 4**	**Много съм изкушен 5**
1. Когато нещата не се развиват в желаната от мен посока.	☐	☐	☐	☐	☐
2. Когато си почивам и водя приятен раговор.	☐	☐	☐	☐	☐
3. С приятели на купон.	☐	☐	☐	☐	☐
4. Когато другите около мен говорят колко обичат да пушат цигари.	☐	☐	☐	☐	☐
5. Когато се страхувам че може да напълнея.	☐	☐	☐	☐	☐
6. Когато съм много нервен и под стрес.	☐	☐	☐	☐	☐
7. Когато се забавлявам.	☐	☐	☐	☐	☐
8. Когато искам да бъда част от групата.	☐	☐	☐	☐	☐
9. Когато ми се иска да опитам вкуса на цигара.	☐	☐	☐	☐	☐
10. Когато искам да отслабна.	☐	☐	☐	☐	☐
11. When I want to be taken seriously.	☐	☐	☐	☐	☐
12. When I want to look mature.	☐	☐	☐	☐	☐
13. When I want to show my independence.	☐	☐	☐	☐	☐
14. When I want to make an acquaintance and don't know how to start.	☐	☐	☐	☐	☐
15. When I am too worried about an exam at school.	☐	☐	☐	☐	☐
16. When my friends want me to try a cigarette.	☐	☐	☐	☐	☐
17. When somebody I am attracted to smokes cigarettes.	☐	☐	☐	☐	☐

DBA in Bulgarian DBA

Тук са описани някой мнения относно избора да остане човек непушач. Прочети всяко твърдение внимателно. След това посочи **КОЛКО ВАЖНО** е всяко едно за *ТВОЯТ* избор да не пушиш цигари. Само **ТИ** можеш да кажеш кои неща са важни и кои не – тук няма верни и грешни отговори.

Колко е важно, че...?	**Никак не е важно** 1	**Не е много важно** 2	**Важно в известна степен** 3	**Доста важно** 4	**Много важно** 5
1. Ще имам по-малко неприятности ако не пуша.	☐	☐	☐	☐	☐
2. Социалният ми живот ще страда ако не съм пушач.	☐	☐	☐	☐	☐
3. Ако не пуша цигари физическите натоварвания ще ми бъдат по-лесни.	☐	☐	☐	☐	☐
4. Ще се чувствам неудобно на купони и събирания ако не пуша.	☐	☐	☐	☐	☐
5. Ще бъда по-зрдав/а ако не пуша.	☐	☐	☐	☐	☐
6. Хора, които за важни за мен няма да ме приемат ако не пуша.	☐	☐	☐	☐	☐
7. Ще запазя въздуха по-чист за всички ако не пуша цигари.	☐	☐	☐	☐	☐
8. Ще имам по-малко приатели ако не пуша.	☐	☐	☐	☐	☐
9. Ако не пуша цигари ше бъда по-привлекателен/а.	☐	☐	☐	☐	☐
10. Ще ми бъде трудно да се справям с проблеми ако не пуша.	☐	☐	☐	☐	☐
11. Ще бъда по-добър модел за поведение ако не пуша.	☐	☐	☐	☐	☐
12. Ще се чувствам нервен/а ако не пуша.	☐	☐	☐	☐	☐
13. Ще мога да покажа на околните, че може да си "готин" без да пушиш.	☐	☐	☐	☐	☐
14. Ще се чувствам по-малко възрастен ако не пуша.	☐	☐	☐	☐	☐
15. Ще се представям по-добре в училище ако не пуша.	☐	☐	☐	☐	☐
16. Ако не опитам да запаля циагра ше пропусна важно преживяване.	☐	☐	☐	☐	☐
17. Ще се чувствам по-напрегнат ако не пуша.	☐	☐	☐	☐	☐
18. Ще се представям по-добре в редица спортове ако не пуша.	☐	☐	☐	☐	☐
19. Цигарите могат да ми помогнат да се успокоя.	☐	☐	☐	☐	☐
21. Родителите ми ще бъдат горди от избора ми да не пуша.	☐	☐	☐	☐	☐
22. Пушенето ше ми помогне да се справя с проблеми.	☐	☐	☐	☐	☐

Staging algorithm for readiness to quit smoking in Bulgarian

SmC

1. **Отказал ли си напълно цигарите?**
   - ☐ Да, преди повече от 12 месеца
   - ☐ Да, преди 6 до 12 месеца
   - ☐ Да, преди 4-5 месеца
   - ☐ Да, през последните три месеца
   - ☐ Не.

2. **Колко цигари си изпушил през последните 24 часа?**_____

3. **Колко често си пушил през последните 30 дни?**
   - ☐ Не съм палил цигара
   - ☐ По-малко от една цигара на ден
   - ☐ 1 до 5 цигари на ден
   - ☐ Около половин кутия цигари на ден
   - ☐ Една кутия цигари на ден
   - ☐ Повече от една кутия цигари на ден

4. **През последната година имало ли е 24 часа в които да не запалиш цигара?**
   - ☐ Да ☐ Не

5. **Имаш ли сериозно намерение да откажеш цигарите през следващите 6 месеца?**
   - ☐ Да ☐ Не

6. **Имаш ли сериозно намерение да откажеш цигарите през следващите 30 дни?**
   - ☐ Да ☐ Не

DBC in Bulgarian

Тук са описани някой мнения относно тютюнопушенето. Прочети всяко твърдение внимателно. След това посочи **КОЛКО ВАЖНО** е всяко едно за **ТВОЯТ** избор да не пушиш или да не пушиш. Само **ТИ** можеш да кажеш кои неща са важни и кои не – тук няма верни и грешни отговори.

Колко е важно, че...?	**Никак не е важно 1**	**Не е много важно 2**	**Важно в известна степен 3**	**Доста е важно 4**	**Много е важно 5**
1. Пушенето прави тийнеиджърите по-уважавани.	☐	☐	☐	☐	☐
2. Цигарите създават лош дъх и миризма на на косата и дрехите.	☐	☐	☐	☐	☐
3. Учениците, които пушат имат повече приятели.	☐	☐	☐	☐	☐
4. Пушенето се отразява на здравето на околните.	☐	☐	☐	☐	☐
5. Пушенето помага да се справи човек с неприятното усещане, когато нещата не се развиават в желаната посока.	☐	☐	☐	☐	☐
6. Пушенето е риско за здравето.	☐	☐	☐	☐	☐
7. Пушенето на цигари доставя удоволствие.	☐	☐	☐	☐	☐
8. Цигареният дим пречи на околните.	☐	☐	☐	☐	☐
9. Пушенето намалява напрежението.	☐	☐	☐	☐	☐
10. Пушенето е вреден навик.	☐	☐	☐	☐	☐
11. Тези които пушат, излизат на повече срещи.	☐	☐	☐	☐	☐
12. Пушенето кара зъбите да пожълтеят.	☐	☐	☐	☐	☐
13. Хората, които пушат изглеждат по-зрели.	☐	☐	☐	☐	☐
15. Учениците, които пушат се забавляват повече.	☐	☐	☐	☐	☐
16. Пушенето е скъп навик.	☐	☐	☐	☐	☐
17. Цигарите правят тежки моменти по-поносими.	☐	☐	☐	☐	☐
18. Пушенето може да доведе до неприатности с родителите ми.	☐	☐	☐	☐	☐
19. Тези, които пушат излизат повече по заведения.	☐	☐	☐	☐	☐
20. Пушенето вече не е на мода.	☐	☐	☐	☐	☐
21. По-лесно е да се запознаеш с нови хора ако пушиш.	☐	☐	☐	☐	☐
22. Пушенето разваля кожата на лицето ми.	☐	☐	☐	☐	☐
23. Цигарите ми помагат да намаля апетита си.	☐	☐	☐	☐	☐

TMPTC in Bulgarian

Различни хора се чувстват изкушени да пушат в определени ситуации. Някои от тях са изброени тук. Моля, посочи доколко се чувстваш изкушен да опиташ да запалиш цигара за всяка от посочените ситуации?

Доколко ТИ лично си изкушен да запалиш цигара...?	**Изобщо не съм изкушен 1**	**Не съм много изкушен 2**	**Изкушен съм в известна степен 3**	**Доста съм изкушен 4**	**Много съм изкушен 5**
1. Когато съм много ядосан на нещо или на някого.	☐	☐	☐	☐	☐
2. Когато приятелите ми предложат цигара.	☐	☐	☐	☐	☐
3. Когато усещам че имам нужда да си подобря настроението.	☐	☐	☐	☐	☐
4. Когато се притеснявам, че може да напълнея.	☐	☐	☐	☐	☐
5. Когато нещата не се развиват в желаната от мен посока.	☐	☐	☐	☐	☐
6. Когато ми е трудно да откажа цигара.	☐	☐	☐	☐	☐
7. Когато осъзная че не съм пушил/а от известно време.	☐	☐	☐	☐	☐
8. Когато искам да отслабна.	☐	☐	☐	☐	☐
9. С чаша кафе.	☐	☐	☐	☐	☐
10. Когато просто жадувам за цигара.	☐	☐	☐	☐	☐
11. Когато се забавлявам на купон.	☐	☐	☐	☐	☐
12. Когато всички около мен пушат.	☐	☐	☐	☐	☐
13. Когато съм отегчен/а.	☐	☐	☐	☐	☐
14. Когато трябва да уча за изпити.	☐	☐	☐	☐	☐
15. Когато се налага да чакам за някого или нещо твърде дълго.	☐	☐	☐	☐	☐
16. Когато съм раздразнен/а от нещо.	☐	☐	☐	☐	☐
17. Когато искам да ям по-малко.	☐	☐	☐	☐	☐

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