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THE STRUCTURE OF SMOKING MOTIVATION: THE DEVELOPMENT AND INITIAL VALIDATION OF A SMOKING MOTIVES INVENTORY

by

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ABSTRACT

There has been increasing pressure on all health-related disciplines, including epidemiology to translate research findings into practice. As a result, the need for valid and reliable data has become increasingly important. The primary objective of the present investigation was to develop a clinically relevant and psychometrically sound measure of motivation for the maintenance of smoking behaviour. A balance of clinimetric and psychometric strategies for scale development was employed. Based on a sample of 200 regular daily smokers, the present study revealed that there are three prominent and important factors that motivate smokers to maintain their smoking behaviour. Specifically, our data demonstrated that regular daily smokers are motivated to maintain their smoking behaviour to reduce or eliminate negative emotions, to satisfy their addiction to cigarettes and to obtain pleasure and relaxation. The literature, however, has identified at least seven factors that motivate smokers to maintain their smoking behaviour. Explanations for the discrepancy in the number of smoking motive factors observed are forwarded. Preliminary psychometric evaluation of the *Smoking Motives Inventory* and two of its subscales, namely *Reduction in Negative Affect* and *Addiction*, indicate strong support for the internal consistency reliability of the scale and initial support for its validity. Further work is required to develop the *Pleasure and Relaxation* factor. Finally, the implications of the findings and directions for future research are presented.

ACKNOWLEDGEMENTS

I dedicate this thesis to my Mother whose ongoing struggle with smoking served to remind me of the value of this work.

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

1. OVERALL AIM

The overall aim of this investigation was to develop a measure of motivation for the maintenance of smoking behaviour and to conduct a preliminary assessment of its psychometric properties.

2. BACKGROUND

2.1 The Importance of Behavioural Science in Epidemiology

Epidemiology is a rich and complex science that derives its methods and techniques from a wide range of disciplines (Terris, 1979). Drawing from medically-related fields such as clinical medicine, toxicology, genetics and microbiology, as well as the social and behavioural sciences and biostatistics to describe, explain, predict and control disease, epidemiology is very much an interdisciplinary science (Friis & Sellors, 1999). The social and behavioural sciences help the epidemiologist clarify the roles of race, education, socio-economic status, as well as behavioural and lifestyle practices in health-related phenomena (Friss & Sellors, 1999). People's behaviour is a key determinant of health and illness. Not only do certain behaviours pose direct risk for disease (e.g., smoking, injection drug use, unprotected sex) but health promotion and disease prevention rely on strategies to modify risk behaviours to attain population health goals. Hence, understanding the factors that "cause" risk behaviours has become a central challenge for epidemiology. Increasingly, epidemiologists have turned to the social and behavioural sciences to understand the complex relationship between behaviour and health, as well as methodology on sampling, measurement, questionnaire design and delivery, and methods of between- and within-group comparison (Friss & Sellors, 1999). It is now widely accepted that epidemiology requires

an interdisciplinary approach in order to disentangle and interpret the interaction of a multitude of factors associated with disease.

Measurement is a fundamental activity of epidemiology. It has been recently reported that questionnaire standards in epidemiology need to be improved (Olsen, 1998; Gallacher, 2000). As funding agencies such as the recently established Canadian Institutes for Health Research (CIHR) and journal editors put increasing pressure on all health-related disciplines, including epidemiology, to translate research findings into practice, the need for quality data increases. There are significant costs to adopting scales of questionable suitability or employing haphazard measurement approaches (Devellis, 1991). Poor measurement imposes an absolute limit on the reliability and validity of the conclusions one can reach (Devellis, 1991). Whether it be in the form of a clinical trial to test the effectiveness of a given smoking cessation intervention or a population survey aimed at examining smoking behaviour, the quality of the epidemiologist's data rests with the reliability and validity of the data collection instruments employed.

2.2 The Epidemiology of Smoking

Smoking is a highly prevalent, modifiable, risk factor for many diseases. In developed countries, it has been estimated that there are currently about two million deaths per year that are attributable to smoking (Peto, Lopez, Boreham et al., 1994). This means that over the decade of the 1990's there will have been approximately 20 million deaths from smoking in developed countries alone (Peto, Lopez, Boreham et al., 1994). Moreover, it has been suggested that if current global smoking trends persist the death toll associated with smoking will reach about 10 million per year by the time today's young children reach middle age

(Doll, 1994). It has been estimated that on average, deaths from smoking result in a loss of 15 years of life expectancy (Peto, Lopez, Boreham et al., 1994). In addition, almost half of all such deaths occur prematurely, that is, before the age of 70 (Peto, Lopez, Boreham et al., 1994). For each of these individuals, the average years of life lost increases to 22 years (Peto, Lopez, Boreham et al., 1994).

Canadian statistics are just as grim. Despite more than 25 years of public-health programs, anti-smoking campaigns, declining social acceptance of smoking, and well-established health consequences linked to smoking, some 6.7 million Canadians aged 15 years and older smoked in 1996/1997, of whom almost 6 million reported smoking on a daily basis (Health Canada, 1999). Moreover, follow-up data from the National Population Health Survey (NPHS) indicate that 9 percent of former smokers in 1994/1995 (Cycle 1) relapsed to smoking by 1996/1997 (Cycle 2), representing approximately 618,000 Canadians (Health Canada, 1999). The two most frequently cited reasons for relapse were stress and exposure to the smoking behaviour of others (Health Canada, 1999).

Utilizing data from both the NPHS and the Canadian Mortality Database, Health Canada recently estimated that 29,229 men and 15,986 women died as a result of smoking in 1996 for a total of 45,215 smoking-attributable deaths (Makomaski Illing & Kaiserman, 1999). Included among these are the deaths of 105 children under the age of one (Makomaski Illing & Kaiserman, 1999). Further to this, it was estimated that smoking was responsible for 26% and 16% of all deaths in 1996 among males and females, respectively (Makomaski Illing & Kaiserman, 1999). Most alarming, however, is the finding that the number of smoking-attributable deaths among women has increased by 77% since 1985

(Makomaski Illing & Kaiserman, 1999). The number of deaths among males has remained relatively unchanged over the same time period (Makomaski Illing & Kaiserman, 1999). Along a similar vein, another study examining the risk of premature death associated with smoking reported that the risk of dying prematurely (before age 70) among lifelong smokers was about two times that expected for a similar cohort of never-smokers (Ellison, Morrison, de Groh et al., 1999).

Estimates of the economic costs associated with the use of tobacco vary widely depending on the methodologies employed, as well as the types of costs included (Choi, Robson & Single, 1997). Smoking-attributable costs specific to health care appear to be fairly consistent with recent dollar figures ranging from 2.5 billion (Kaiserman, 1997) to 2.7 billion (Single, Robson, Xie et al., 1996) per year. Estimates of the overall costs associated with tobacco, however, are considerably more variable. For instance, where Kaiserman (1997) estimated that smokers cost society about $15 billion per year, Single et al. (1996) calculated overall annual smoking-attributable costs to be closer to $9.6 billion. Regardless of the estimate employed, either figure represents an incredible burden to society both in terms of direct health care costs, as well as indirect costs such those related to worker absenteeism, decreased productivity and lost future earnings. Above and beyond the strictly economic costs, are the incalculable psychological and emotional costs incurred to the families and friends of the dead and dying smokers (Kaiserman, 1997).

The health consequences associated with smoking manufactured cigarettes are now well established. Research discovering a close association between smoking and premature mortality was first published in 1950 by Doll and Hill (Doll & Hill, 1950; Doll, 1994). Since

then, a myriad of studies have clearly demonstrated that the associations observed between smoking and many diseases are, for the most part, causal in nature (Doll, 1994). The past two decades have observed, however, a growing interest in the health risks associated with involuntary smoking or exposure to environmental tobacco smoke (ETS).

It is estimated that 330 nonsmoking Canadians die each year as a result of lung cancer caused by exposure to ETS (Wigle, Collishaw, Kirbride et al., 1987). Recently, much of the research examining the burden of ETS-related illness and disease has focussed on respiratory conditions in children. Cumulatively, the evidence from this body of work demonstrates that parental smoking causes an increased incidence of respiratory disease (e.g., bronchitis, pneumonia and asthma) in young children from birth to three years of age (Rylander & Pershanger, 1995). In Canada, it is estimated that about 2.8 million or 47% of all children are exposed to tobacco smoke in the home (Health Canada, 1995a). In response to increased public concern and mounting evidence of the adverse health effects associated with exposure to ETS, many communities across Canada have enacted by-laws and developed policies which effectively ban or restrict smoking in many workplaces and public buildings (Health Canada, 1995b). Despite recent progress in this area, data from the NPHS has revealed that 28% of the Canadian daily smokers surveyed reported no restrictions on their smoking at their place of work (Health Canada, 1999).

Overall the evidence strongly suggests that by avoiding the use of cigarettes, the excess risk of disease experienced by smokers and those exposed to environmental tobacco smoke can be largely avoided. However, scientific evidence also reveals that substantial health benefits are attained by those persons who successfully quit smoking irrespective of

age, gender or status of health. The fact that over 80% of Canadian smokers believe that quitting smoking will improve their health and overall well-being demonstrates the impressive gains that have been made in the domain of public knowledge (The National Clearinghouse on Tobacco & Health, 1995). Nevertheless, the incongruence between knowledge of tobacco-related health risks and the high rate of smoking suggests that the motives to smoke still outweigh the perceived health hazards associated with smoking (Ho, 1989).

2.3 Understanding the Maintenance of Smoking: The Role of Behavioural Epidemiology

Smoking is a major risk factor for many diseases and as such is an important behavioural determinant of health. Prerequisite for risk are the establishment and maintenance of smoking behaviour. Improved knowledge of the factors associated with the maintenance of smoking holds great promise for the prevention and reduction of risk associated with this behaviour (Friss & Sellors, 1999). Paradoxically, even though the adverse consequences of smoking are widely known in the population, risk-knowledge has little, if any, effect on this behaviour (Glanz, Lewis & Rimer, 1997). One key to developing more effective interventions is in understanding the motivational basis for the maintenance of smoking.

Behavioural epidemiology is the specific branch of epidemiology concerned with studying the role of behavioural factors in health. Behavioural factors have been recognized as prominent contributors to human health outcomes throughout history (Glanz, Lewis & Rimer, 1997). Consistent with its primary discipline, the aim of behavioural epidemiology

is to understand the relationship between behaviour and health status and apply this knowledge to the development and implementation of effective intervention strategies. Concerned with the study of personal behaviour, psychology brings a prolific tradition of over one hundred years of research and practice on individual differences as well as on human motivation and behavioural change to behavioural epidemiology (Glanz, Lewis & Rimer, 1997).

As a discipline, epidemiology has borrowed with increasing frequency from the theoretical and conceptual bases of the behavioural sciences for explanatory frameworks of disease (Friss & Sellors, 1999). Although the unit of observation in epidemiology is typically a group or population, those concerned with explaining and influencing human behaviour must have an understanding of the role of the individual factors on health-relevant behaviour, and how these factors are distributed in the population.

2.4 Motivation in Human Behaviour

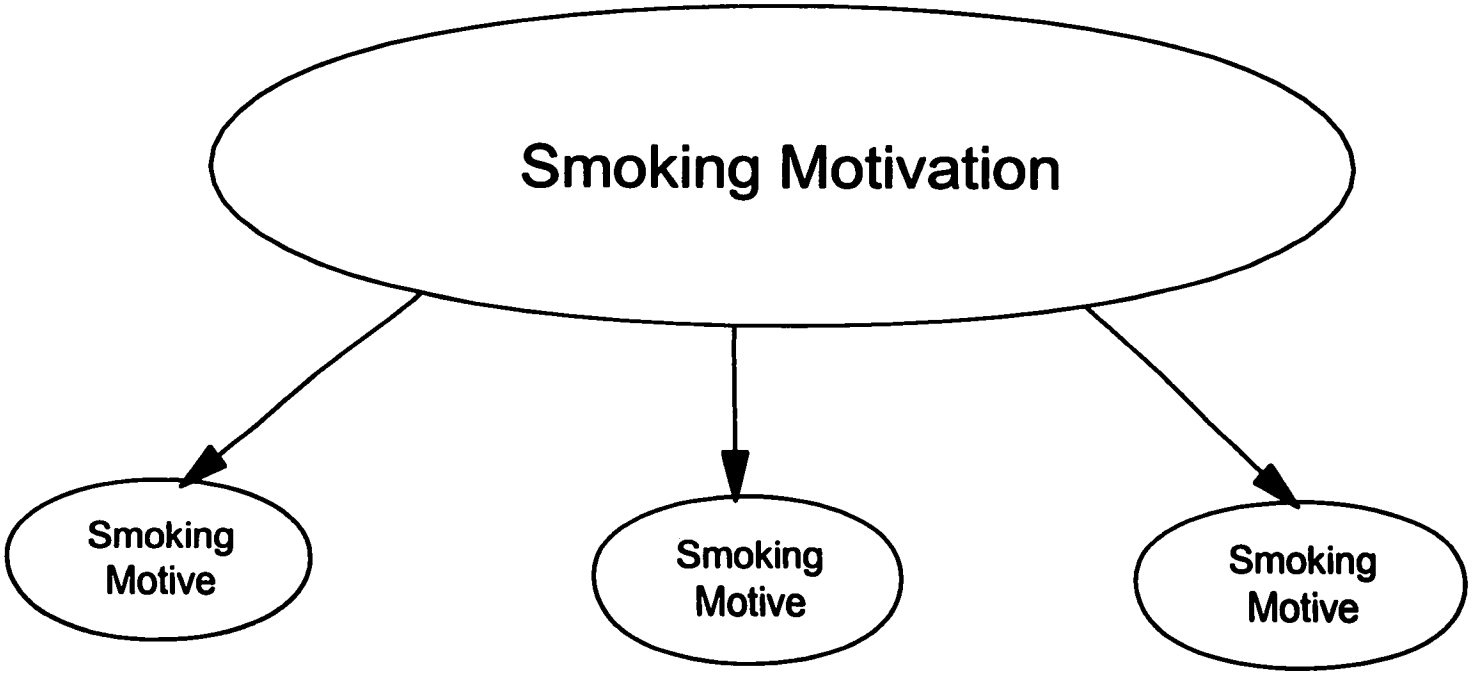
Through the concept of "*motivation*" behavioural and social scientists attempt to explain what triggers or activates human behaviour. The concept of motivation helps to explain why a certain behaviour occurs in one situation and does not occur in another (Petri, 1991). Motivation is complicated and has proven difficult to define. Generally speaking, however, motivation is understood as the latent construct used to describe the forces acting on or within the individual to initiate and direct behaviour (Petri, 1991). Simply stated, motivation involves goal-directed behaviour.

Depending on the complexity of the behaviour in question, there may be several different forces that act on the individual to engage in the behaviour each of which would be

considered a "*motive*". A motive is defined as a state of tension within the individual that "arouses, maintains and directs behaviour toward a goal" (Chaplin, 1985) or in laymen's terms, a motive is the reason the individual gives for his or her behaviour. Figure 1 presents a schematic which differentiates the latent construct of motivation from motives which are manifest in the behaviour. The figure demonstrates that the structure of motivation for a particular behaviour may be defined by the composition of motives that influence the individual to engage in the behaviour. More complicated behaviours will be defined by a more complex or multifactorial structure whereas the reverse will be true for less complicated behaviours.

There are several theoretical approaches to the study of human motivation. These theories differ primarily in whether they emphasize the innate, biological basis of motivation or the learned, social basis of motivation. Drive theories of motivation are an example of the former. The drive approach to understanding motivation was most fully explored by Clark Hull in the 1940's and 1950's (Weiten, 1992). The cornerstone of Hull's concept of drive is that people seek to maintain "*homeostasis*" - a state of physiological equilibrium or stability. When applied to human behaviour, a drive is regarded as an internal state of tension that motivates the individual to engage in activities with the aim of reducing this tension. These states of tension are considered to be unpleasant disturbances in the desired equilibrium (Weiten, 1992). The hunger motive provides a simple illustrative example of the drive theory in action. If an individual goes without food for a while, they will begin to experience hunger or what may be referred to as internal tension. This internal tension is considered to be the drive or motive which directs the individual to seek food. When the individual eats

Figure 1: The Structure of Smoking Motivation



they reduce the tension and thus restore equilibrium. Although the concept of homeostasis and drive theories work well to explain some behaviours they do not explain all motivation. Because drive theories assume that people are motivated to reduce internal tension they cannot explain, for instance, why a person may eat a bowl of ice cream when they are not hungry (Weiten, 1992). These types of situations are more easily explained by the incentive theories of motivation.

Where drive theories postulate that internal tension motivates behaviour, incentive theories propose that external stimuli or learned goals regulate human motivation. According to incentive theories, external goals that have the capacity to motivate behaviour are incentives (Weiten, 1992). Returning to our previous example, the incentive theory would propose that the individual who ate the bowl of ice cream despite not being hungry was motivated to do so as a result of being exposed to the ice cream or learned external stimulus (e.g., taste, relieve boredom). Incentive theories of motivation emphasize environmental stimuli and downplay the biological bases of human motivation (Weiten, 1992).

Drive and incentive theories of motivation are often contrasted as "*push versus pull*" theories (Weiten, 1992). Drive theories emphasize how internal states of tension "*push*" people toward certain behaviours to achieve homeostasis, whereas incentive theories emphasize how external stimuli "*pull*" people to behave in certain ways (Weiten, 1992). According to drive theories, the source of motivation is within the individual. In contrast, incentive theories propose that the source of motivation can be found in the environment, or outside of the individual.

Regardless of the particular theoretical orientation, motivation is understood as the

concept employed to describe the forces acting on or within the individual to initiate and direct behaviour (Petri, 1991). Further, motivation is also used to indicate the direction or target of behaviour, as demonstrated in the example of the hunger motive.

2.5 The Maintenance of Smoking Behaviour

Research evidence leaves little doubt that smoking is an addictive process and that regular smokers self-administer tobacco to maintain comfortable blood levels of nicotine, a primary active substance in tobacco (Gatchel, Baum & Krantz, 1989). However, in addition to the well-known physical dependence of regular smokers on nicotine, other factors including social and psychological variables have also been found to be instrumental in the maintenance of smoking behaviour. For example, in addition to reporting that they smoke "*out of habit*", experienced smokers commonly report smoking to manage negative emotions such as anger and sadness, to cope with stress, to help them concentrate, to fit in at social gatherings, as well as smoking simply for pleasure and relaxation.

Research aimed at identifying the factors which motivate regular smokers to maintain their smoking has been guided by three distinct, yet complementary approaches: smoking typologies, smoking urges and cravings, and smoking outcome expectancies. Each of these perspectives addresses some aspect of the multifactorial structure of motivation as it pertains to the maintenance of smoking. Combined, the three perspectives serve to strengthen and broaden our understanding of the motivational factors underlying the maintenance of smoking behaviour. However, an analysis of the measurement tools derived from each of the these perspectives reveals that although each of the instruments examined appears to address an aspect of motivation, not one does so comprehensively. In other words, not one of the

measurement tools examined captures the full complexity of the behaviour in its measurement of smoking motives. Furthermore, an evaluation of the item content of each of the instruments, with the exception of the *Smoking Consequences Questionnaire* (Brandon & Baker, 1991) which was designed to measure smoking-related outcome expectancies, indicates that very few items actually measure the specific smoking motive they purport to measure. Given this, it is not surprising that these scales, in particular the smoking typology scales, have not fared well in validity studies. In fact, in a comprehensive review of their psychometric properties, Shiffman (1993) demonstrates that although smoking typology scales appear to possess adequate reliability, they have not been shown to be valid measures of smoking patterns and motives. This, in spite of the fact that they have been widely employed to differentiate smokers for both research and treatment purposes for quite some time.

Though purporting to measure smoking motives, the constructs assessed by smoking typology scales are more consistent with measuring smoking-related antecedents and expectancies, as well as the effects of smoking (Shiffman, 1993). Furthermore, when compared to data collected through the self-monitoring of smoking behaviour, there has been little correspondence between smoking motive factors and smoking patterns in the natural environment. In fact, Shiffman (1993) demonstrates that the average correlation between scores on smoking typology scales and actual smoking patterns in the natural environment is .18. In other words, this means that only 3.2% of the variance in scores obtained on smoking typologies is attributable to actual differences in smoking patterns and motives in the natural environment.

2.6 The Next Step in the Investigative Process

The overall aim of the present investigation was to initiate the development of a psychometrically sound and clinically relevant scale to measure smoking motives. Valid and reliable assessment is crucial if we are to have any confidence in the inferences we make about people on the basis of their scores on a given measurement tool. However, when applied in a clinical setting such as in the evaluation of the effectiveness of a particular smoking cessation intervention or to increase self awareness among participants of such an intervention, it is not enough that the scale be psychometrically sound -- it must also be clinically relevant. In other words, the items that make up the instrument must be relevant to the clinicians and individuals who rely on it.

A psychometrically sound and clinically relevant measure of smoking motives will not only increase our empirical understanding of the motives which underlie smoking behaviour but will also be useful as an indicator of client-specific intervention needs. In fact, it has been suggested that the prevalent weakness of contemporary interventions to induce long term cessation may be due to a failure to consider individual differences in the mechanisms that sustain smoking behaviour (Shiffman, 1993; Prochaska & DiClemente, 1983). Thus, from a clinical perspective, the sound assessment of smoking motives and patterns raises the promise of client-treatment matching, as different intervention strategies may be delivered to smokers differing in their smoking motive profiles (Shiffman, 1993; Prochaska & DiClemente, 1983). Furthermore, research directed at determining the factors which motivate individuals to maintain their smoking behaviour, despite their awareness of the health risks, will prove beneficial in terms of providing investigators, and health

professionals alike, with the information necessary to understand the motivational basis underlying the maintenance of smoking behaviour in the population.

The following literature review focuses on the problem of why regular smokers maintain their smoking behaviour. The review begins with a discussion of how "*motivation*" explains the behaviour of regular smokers. This is followed by a discussion of the three approaches to the investigation of smoking behaviour. As a basis for developing a more comprehensive and psychometrically sound measure of smoking motivation, the measurement tools derived from each perspective are evaluated. The chapter closes with a summary of the constructs found to be relevant to the measurement of smoking motivation and a presentation of the study objectives.

3. LITERATURE REVIEW

3.1 Motivation: What Contributes to the Maintenance of Smoking

Studied predominantly by psychologists, but employed broadly in health promotion and disease prevention, motivation is understood as an intervening variable used to account for factors within the individual that arouse, maintain and channel behaviour toward a goal (Chaplin, 1985). Although we cannot directly observe "*motivation*" per se, we can observe and measure the behaviours, which according to our definition or theory of motivation, are the consequence of it. Thus, where it concerns smoking behaviour, we may say that motivation is a latent, multidimensional construct that is manifested in the behaviour of smoking.

Many factors influence the maintenance of smoking among regular smokers. A common theme across theoretical orientations is that by smoking, regular smokers strive or are motivated to attain a homeostatic balance by regulating positive and/or negative reinforcement [a]. More specifically, the literature consistently demonstrates that regular smokers maintain their smoking behaviour in an unremitting, cyclical, effort to obtain the perceived benefits of smoking and to avoid the negative consequences of not smoking. With respect to negative reinforcement, we have already acknowledged the powerful pharmacological influence of nicotine and that regular smokers maintain their smoking behaviour to reduce or eliminate the symptoms associated with nicotine withdrawal. In terms

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[a] In positive reinforcement, smoking leads to the presentation or maintenance of a rewarding condition, whereas in negative reinforcement, smoking leads to the removal of an aversive or unpleasant condition. Both types of reinforcement involve favourable consequences and both strengthen the behaviour of smoking.

of positive reinforcement, the literature reveals that regular smokers maintain their smoking behaviour to experience the positive reinforcing effects of smoking, such as heightened alertness, pleasure and relaxation, increased sociability among peers, as well as enhanced positive emotional states. Thus, from within the context of motivation, we operationally define smoking as:

> *a goal-directed behaviour, wherein which regular smokers maintain their smoking behaviour to experience the benefits associated with smoking, whether it be the enhancement or maintenance of positive consequences of smoking or the reduction or elimination of the negative consequences associated with not smoking.*

3.2 The Maintenance of Smoking Behaviour: A Review of Three Approaches

The possibility that the maintenance of smoking behaviour may be motivated by an identifiable number of specific factors has generated a tremendous amount of research on smoking motivation using at least three frameworks, namely, smoking typologies, smoking urges and cravings and smoking outcome expectancies. An examination of both the shared and unique contributions forwarded by the three perspectives will serve to strengthen and broaden our understanding of the underlying structure of motivation where it concerns the maintenance of smoking behaviour. We begin the present review with an evaluation of the literature on smoking typologies. This is followed by the literature on smoking urges and cravings and finally, the literature on smoking outcome expectancies.

3.2.1 Smoking Typologies

The idea that smokers differ on the basis of the factors which motivate them to maintain their smoking behaviour suggests that there may be different " types" of smokers

and that interventions may be tailored to meet their specific needs (Shiffman, 1993). Prior to the development of smoking typology scales researchers generally classified smokers on a number of crude, behaviourally descriptive, dimensions: regular or occasional, heavy or light and inhaler or non-inhaler (Russell, 1971). However, in the late 1960s and early 1970s two more sophisticated classifications of smokers emerged (Russell, 1971). One scheme classified smokers according to the occasions on which they smoke, whereas the other was based on the instrumental use of smoking, i.e., to manage feelings and emotions. While the former offers insight into how smoking behaviour is maintained by those conditioned cues associated with certain activities (Shiffman, 1993), the latter is grounded in Tomkins' assertion that "the key to understanding smoking behaviour is to be found in the management of affect" (Tomkins, 1966).

Of the two, Tomkins' affective classification scheme is most frequently adopted. According to Tomkins (1966), smoking is a learned behavioural response which is intrinsically associated with positive and/or negative affect[b]. Moreover, it was theorized that, based on the management of affect, smokers could be differentiated on the basis of four general types of smoking behaviour: (1) smoking to increase positive affect; (2) smoking to reduce negative affect; (3) habitual smoking, or smoking with no affect; and (4) addictive smoking which involves both positive and negative affect. The four types of smoking behaviour are described in detail below.

Positive affect smoking can be of two types; for either relaxation or stimulation

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[b] According to Tomkins (1966), the term *affect* refers to human feelings and emotions. It is proposed that feelings and emotions are the primary motives underlying human behaviour.

(Tomkins, 1966). Smokers who engage in positive affect smoking in the form of relaxation are defined as those who "characteristically smoke under pleasant circumstances which are relaxing -- such as at the end of a meal, or in the midst of a pleasant conversation" (Tomkins, 1966). Relaxant smoking is associated with the positive affect of enjoyment (Ikard, Green & Horn, 1969). Stimulant smoking, on the other hand, is "used to give the person a lift from the positive affect of excitement ..." (Tomkins, 1966), such as when the experienced smoker smokes to relieve boredom. An additional form of positive affect smoking involving the sensorimotor gratification derived from smoking was later suggested by Horn (Tomkins, 1966).

In negative affect smoking, also called *sedative smoking*, the individual's primary reason or motive for smoking is to reduce negative feelings such as distress, fear, shame, disgust, or any combination of these (Tomkins, 1966). Thus, where the positive affect smoker is more likely to smoke when he or she is feeling relaxed and comfortable, the negative affect smoker is more likely to smoke in situations in which negative feelings and emotions are evoked (Ikard, Green & Horn, 1969).

Habitual smoking, as Tomkins (1966) conceived of it, "involves a minimal degree of awareness with little reward". Though the habitual smoker may have originally smoked to reduce negative affect or enhance positive affect, he or she "has long since ceased to do so" (Tomkins, 1966). Smoking primarily out of *habit*, the habitual smoker is often unaware that they already have one cigarette burning when they light another. In fact, the habitual smoker may "hardly be aware that he [or she] has a cigarette in his [or her] mouth" (Tomkins, 1966).

Finally, in addictive smoking both positive and negative affect are intricately involved in such a way that there is, what Tomkins refers to as, *psychological addiction*. The addictive smoker is always aware of when he or she is not smoking and invariably this awareness is accompanied by feelings of negative affect (Ikard, Green & Horn, 1969). If the addictive smoker is not able to smoke, he or she experiences "an exponential increase in negative affect" (Ikard, Green & Horn, 1969), followed by the expectation that this will become intolerable. Tomkins asserts that the addictive smoker believes that "only a cigarette will reduce his [or her] suffering" (Tomkins, 1966) and should one be neither available nor permitted, the addictive smoker's expectation that the situation will become unbearable will ultimately be confirmed (Ikard, Green & Horn, 1969). When the addictive smoker finally smokes he or she "experiences a sudden decrease of negative affect" while simultaneously experiencing an "evocation of positive affect" (Ikard, Green & Horn, 1969). As a result, the subjective experience of reversing negative affect for positive affect confirms the addictive smoker's prior expectation that only a cigarette will bring relief from his or her suffering (Ikard, Green & Horn, 1969). In sum, Tomkins asserts that smokers can be differentiated and categorized on the basis of four general types of smoking behaviour and that the underlying factor common to each is the management of affect. Thus, according to Tomkins (1966), the "*motive*" underlying smoking behaviour is the management of positive and/or negative affect.

3.2.2 Smoking Urges and Cravings

In this approach, urges, wants and desires are construed as the motivational factors which compel individuals to action and provide such action with direction (West &

Schneider, 1987). Where "urges" are interpreted as being more comprehensive in terms of their behavioural influence, the term "craving" has been used to describe the specific urges or desires to smoke.

Smoking urges and cravings probably arise partly out of the perceived positive value of smoking and the negative consequences associated with not smoking, and partly as a result of withdrawal from nicotine (West & Schneider, 1987). It has been widely accepted that subjective urges and cravings for cigarettes play an instrumental role in the maintenance of smoking behaviour (Willner, Hardman & Eaton, 1995). In fact, urges and cravings have been identified as significant characteristics or attributes of tobacco withdrawal syndrome and are the most frequently reported cause of relapse to smoking from abstinence (Tiffany & Drobes, 1991). Although the late 1960s and early 1970s witnessed a decline in the use of urges and cravings as explanatory constructs in the study of addictive behaviour, a review of more contemporary literature reveals a resurgence of interest in their role (Tiffany, 1990).

An assumption common to practically all extant theories or models of drug urges is that urges are "subjective, emotional-motivational states" (Tiffany, 1990). According to Tiffany (1990) drug urges are *subjective* in the sense that they are dependent upon the personal experience of the individual, they are *emotional* in that the subjective experience of the individual is believed to possess some hedonistic qualities, and finally, drug urges are construed as *motivational* in the sense that the subjective urge state is presumed to be primarily responsible for the activation of drug-seeking behaviour.

Evidence on smoking craving has accumulated and supports the motivational construct. Several studies have tested the hypothesis that smokers with higher scores on

measures of addiction experience greater craving during abstinence. In one such study, Williams (1979) reported that higher scores on the addictive subscale of the *Reasons for Smoking* scale (RFS) predicted greater self-reported craving during abstinence. Similarly, strong positive correlations between craving and scores on the addictive subscale of the *Motives for Smoking* scale (MFS) have been documented (Russell, Peto & Patel, 1974; West & Russell, 1985).

Evidence in support of smoking craving, as a motivator of smoking, has also been found in studies examining the relationship between craving and amount smoked. Retrospective reports of frequent craving have been found to be more common among those smokers who report a higher consumption of cigarettes (Tiffany, 1990). Furthermore, measures of nicotine and other biochemical markers indicative of amount smoked have been found to correlate positively with craving reflecting the possibility of a dose-dependency effect (West & Russell, 1985).

Research aimed at establishing a link between craving and both the benefits contingent on smoking and the negative consequences contingent on abstinence has also been conducted. West and Schneider (1987) report that positive associations have been found between craving and smoking for stimulant motives as well as between craving and smoking for pleasurable relaxation. Moreover, it has been shown that both stress and boredom typically result in a greater consumption of cigarettes, suggesting that craving is associated with the ability of smoking to either sedate or stimulate (West & Russell, 1985) depending on the specific goals of the individual smoker.

Regarding perceived discomfort contingent on abstinence, craving for smoking has

been found to correlate positively with symptoms characteristic of tobacco withdrawal syndrome. More specifically, it has been consistently demonstrated that craving for smoking is positively associated with such symptomatology as increased irritability, restlessness and an inability to concentrate (West & Schneider, 1987).

In sum, urges and cravings for cigarettes appear to play an instrumental role in the maintenance of smoking behaviour. With regard to underlying causal factors, the literature suggests that smoking urges and cravings arise partly out of the perceived positive benefits associated with smoking and the perceived disadvantages of abstinence and partly out of the subjective pharmacological or addictive experience associated with withdrawal from nicotine.

3.2.3 Smoking Expectancies

In recent years, the construct of *expectancy* has figured prominently in a number of theories giving a central role to cognitive processes in addiction motivation (Brandon & Baker, 1991; Wetter, Smith, Kenford et al., 1994; Leigh & Stacy, 1993). Many contemporary models of substance abuse have incorporated outcome expectancies, at one stage or another along the causal pathway, as determinants of substance use initiation, maintenance as well as relapse (Brandon & Baker, 1991; Leigh & Stacy, 1993).

There is an emerging consensus within the current motivational literature that "goal striving is the organizing force behind behaviour" (Cox & Klinger, 1988) and that people strive to attain goals because they *expect* that reaching them will bring about changes in affect. Although changes in affect may be caused by any one of a multitude of factors, it is hypothesized that a major source of influence stems from peoples' beliefs and expectancies

that certain consequences -- either desirable or undesirable -- will result (Leigh & Stacy, 1993; Cox & Klinger, 1988). This raises the possibility that substance-related beliefs and expectancies could mediate peoples' behaviours and emotions (Leigh, 1989).

The construct of smoking-related expectancies originates from MacAndrew and Edgerton's influential treatise on alcohol and disinhibition published in 1969 (Leigh, 1989). Drawing on considerable anthropological evidence, MacAndrew and Edgerton argued that the variations consistently observed in alcohol-induced behaviour were more consistent with a social learning or cultural modeling perspective than a pharmacological one (Leigh, 1989). Specifically, peoples' beliefs and expectancies about the powers of alcohol to influence their behaviour were learned from modeling both the prevailing culturally- and temporally-appropriate behaviours associated with the consumption of alcohol (Leigh, 1989). When applied to smoking behaviour, it is postulated that smoking is maintained by the "ongoing expectations of its ability to produce desired outcomes" (Leigh, 1989).

The last few years has witnessed a growing interest in the relationships between expectancies and smoking. With respect to smoking behaviour, a positive relationship between positive expectancies and rate of use has been established among samples of early adolescents (Gordon, 1986), college students (Brandon & Baker, 1991), as well as among more experienced adult smokers (Copeland, Brandon & Quinn, 1995). In addition, the literature indicates that smoking-related outcome expectancies are influential determinants in smoking initiation, maintenance and relapse. In sum, the smoking expectancy literature suggests that people are motivated to smoke in order to attain goals because they expect that reaching them will bring about changes in affect.

3.3 An Evaluation of Existing Measurement Tools

Despite differences in the specific factors considered to be influential, the research stemming from the three theoretical orientations demonstrates that regular smokers smoke to experience the positive consequences associated with smoking and to avoid the negative consequences associated with abstinence.

To support the development of a clinically relevant and psychometrically sound measure of smoking motivation, an evaluation of the measurement tools stemming from each of the three perspectives is necessary. In evaluating the usefulness of a measure we must be concerned with what the scale is measuring (Streiner & Norman, 1995). More specifically, we must be concerned with the scale's validity, that is, whether the scale or subscale measures what it is intended to measure. The three most common forms of validity are: content, criterion and construct validity. At this point in time, we are interested in evaluating the construct and content validity of these scales from within the context of smoking motivation. Although not all of the scales examined here were specifically designed to measure smoking motivation, we are nevertheless interested in examining their content to ensure that we have captured all relevant motivational domains or smoking motives. As previously noted, smoking typology scales which purport to measure smoking motives have not been found to be valid measures of smoking patterns and motives, thus warranting a closer examination.

In general, the construct-related validity of a scale is the extent to which it may be said to measure a theoretical construct (Streiner & Norman, 1995). For our purposes, this was demonstrated by the fit between the constructs or motivational domains measured by the

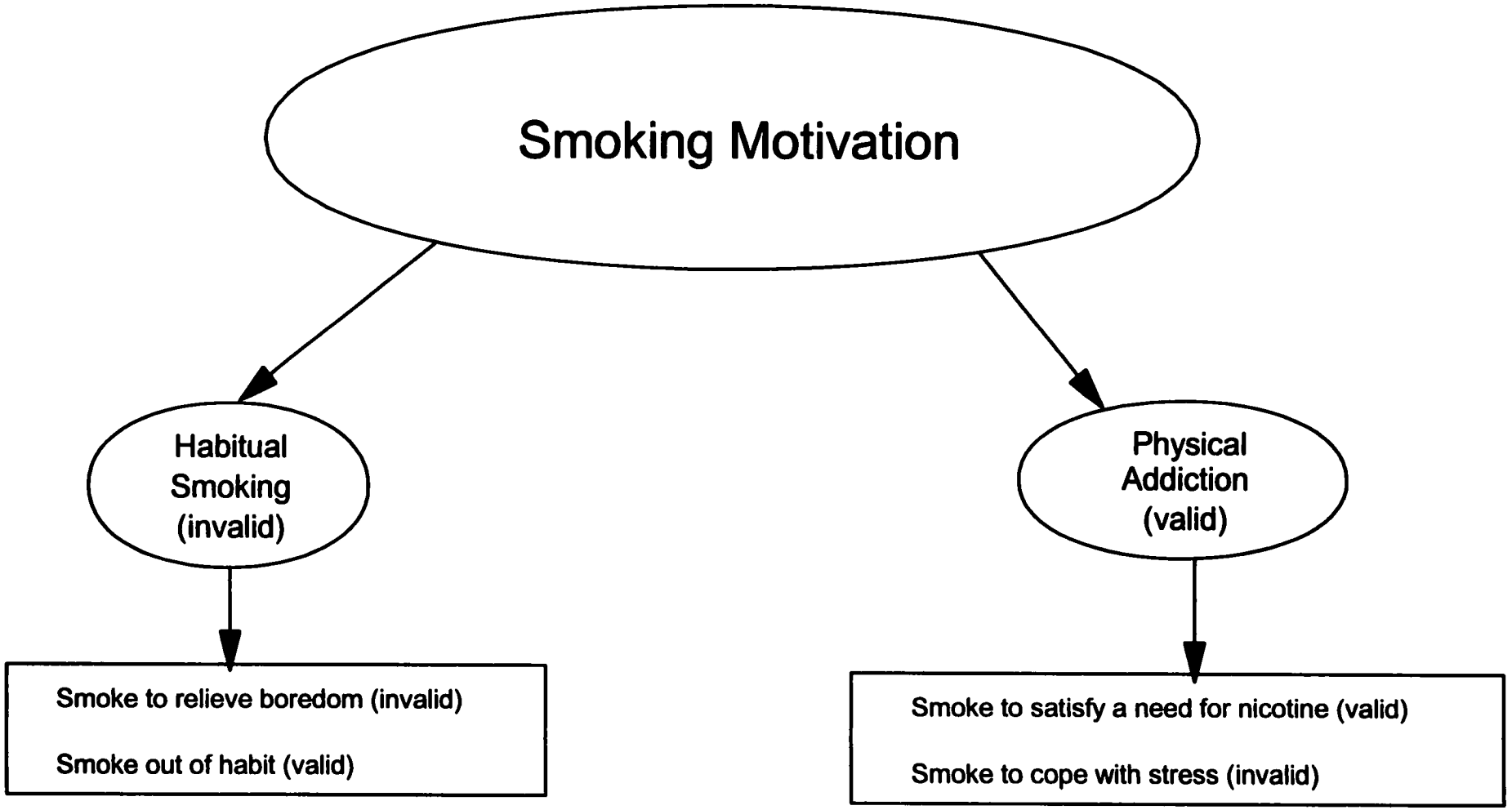
scale and our operational definition of smoking from within the context of motivation. Thus, to be considered to relevant, each of the constructs had to reflect smoking as a goal-directed behaviour.

Content-related validity, on the other hand, is the extent to which a scale's item content reflects the construct the scale is intended to measure (DeVellis, 1991; Streiner & Norman, 1995). Here, we were interested in evaluating the scale's items in terms of how well they measure the specific construct or smoking motive they are intended to measure. An item was considered valid if it specifically measured the smoking motive it was developed to measure. Figure 2 provides an example of both a valid and invalid construct as well as a valid and invalid item.

3.3.1 Smoking Typology Scales

Smoking typology scales are based on the assumption that there are different types of smokers and that they can be identified and differentiated by these measures (Shiffman, 1993). A review of the historical development of smoking typologies reveals that the first attempt to develop such a scale was made by Schwartz and Little in 1965 and that it was based on Tomkins' theory of affect (Ikard, Green & Horn, 1969). Revised a year later by Horn and Waingrow, the *Reasons for Smoking Scale* (RFS) was included in an American national survey conducted for the Public Health Service in the spring of 1966 (Ikard, Green & Horn, 1969). Since the development and widespread acceptance of the RFS, a number of similar smoking typologies have been developed. Among the more well-known are the *Occasions for Smoking* scale (OFS) (McKennel, 1970) and the *Motives for Smoking* scale

Figure 2: Illustrative Example of Valid and Invalid Constructs and Items



(MFS) (Russell et al., 1974). Some version of these scales can be found in most self-help pamphlets as well as in many research protocols investigating smoking (Shiffman, 1993). In a critical review of smoking typology scales, Shiffman (1993) demonstrates that these three scales overlap substantially in content as well as concept. This is especially true of the RFS and MFS, as Russell et al.(1974), developed the latter by combining items of the OFS and RFS.

As Table 1 demonstrates, the three typology scales possess a number of constructs in common. Specifically, all three scales share the constructs of *Pleasure Relaxation* and *Stimulation* smoking. Furthermore, the RFS and MFS share three constructs, that is, *Habitual*, *Addictive* and *Sensorimotor* smoking, whereas the OFS shares *Social Confidence* with the MFS and *Negative Affect Reduction* with the RFS. It should be noted, however, that although Russell et al. (1974) did not extract a factor corresponding to *Negative Affect Reduction* in their research, they did conclude that it should be retained for analytical purposes.

Consistent with the theoretical underpinnings of the RFS, six of the seven constructs identified above are reflective of the four general types of smoking outlined by Tomkins. It will be recalled that the *Pleasure Relaxation*, *Sensorimotor* and *Stimulation* constructs parallel Tomkins' smoking to increase positive affect, whereas the *Habitual* and *Negative Affect Reduction* constructs are consonant with Tomkins' habitual smoking and negative affect smoking, respectively. Finally, the *Addictive* construct is consistent with Tomkins' addictive type of smoking behaviour.

In addition to shared constructs, Table 1 shows several unique conceptual domains

Table 1

Correspondence Among Three Smoking Typology Scales

Correspondence Among the RFS, OFS and MFS Smoking Typologies				
RFS	**OFS**	**MFS**	**Construct**	**Prototypical Item**
Habitual		Automatic	Smoking without awareness	I've found a cigarette in my mouth and didn't remember putting it there (RFS)
Addictive		Addictive	Smoking in response to craving	Between cigarettes, I get a craving that only cigarettes can satisfy (RFS)
Negative Affect Reduction	Nervous Irritation	_____[a]	Smoking when upset	I light up a cigarette when I feel angry about something (RFS)
Pleasurable Relaxation	Relaxation	Indulgent	Smoking for pleasure	I find cigarettes pleasurable (RFS)
Sensorimotor Manipulation		Sensorimotor	Smoking for sensory and motor aspects	Part of the enjoyment of smoking a cigarette comes from the steps I take to light up (RFS)
Stimulation	Activity Accompaniment	Stimulation	Smoking for stimulation	I like smoking when I am busy and working hard (MFS)
	Social		Smoking in company	Smokes at a party (OFS)
	Social Confidence	Psychosocial	Smoking to boost social image or confidence	When smoking I feel more confident with other people (MFS)
	Smoking Alone		Solitary smoking	Smokes when alone (OFS)
	Food Substitution		Smoking to suppress appetite	Smoking instead of eating sweets (OFS)

Adapted from Shiffman [19]. Note: [a] Russell et al. did not extract a negative affect reduction factor in their research but concluded that it should be retained for analysis.

measured primarily by the OFS. Three of these four constructs tap various social aspects of smoking. Specifically, where the *Social* and *Smoking Alone* constructs appear to measure the two dimensions of a bilateral social facet of smoking behaviour; that is, smoking in the company of others or smoking alone, the *Social Confidence* (OFS) or *Psychosocial* (MFS) constructs tap the perceived social image and confidence benefits associated with smoking. Finally, the OFS includes a *Food Substitution* construct which measures smoking as a means to suppress appetite.

This review of the constructs or motivational domains measured by the three smoking typology scales has identified at least ten different motives that are postulated to contribute to the maintenance of smoking behaviour. However, when evaluated against our operational definition of smoking, we find that three of the ten constructs are not specifically related to smoking motivation. More precisely, the constructs of *Habitual Smoking*, *Social Smoking* and *Smoking Alone* do not measure smoking motivation; that is, they do not reflect smoking as a goal-directed behaviour. Rather, in the case of *Habitual Smoking*, smoking is simply defined as "smoking without awareness". According to this definition, there is no goal striving or underlying motivation associated with habitual smoking. With respect to *Smoking Alone* and *Social Smoking*, measured uniquely by the OFS, it is observed that these two constructs measure the occasions on which people smoke and do not address the motivational basis for smoking in these situations.

Content-related validation involves the systematic examination of a scale's content to determine whether the item content reflects the construct which the scale is intended to measure (Shiffman, 1993). For our purposes, we are interested in evaluating whether the

construction of the items is consistent with the measurement of a smoking motive. Tables 2 through 4 present the item content for each of the factors measured by the RFS, OFS and MFS, respectively.

An examination of the item content of the RFS (see Table 2), a typology scale whose authors purport to measure motivation for smoking, reveals that only a few of its items actually measure a smoking motive specifically (Shiffman, 1993). In fact, only three of the 23 items which make up the RFS measure smoking motives: all three items fall under the domain of *Stimulation Smoking*. Rather than measuring smoking motives, the RFS is comprised of a "heterogeneous mix of items" (Shiffman, 1993) about the antecedents and consequences of smoking, the effects of not smoking, the enjoyment associated with smoking, smoking patterns, and finally, motives for smoking.

A similar evaluation of the item content of the OFS (see Table 3) reveals that only two of its 33 items measure smoking motives specifically. Both of the smoking motive items fall under the *Food Substitution* construct. It should be pointed out, however, that the OFS does not purport to measure smoking motivation specifically. Rather it is intended to measure the occasions on which people smoking and thus, more appropriately focuses on the antecedents of smoking.

The MFS is the final typology scale to be evaluated for content validity. Although called the *Motives for Smoking* scale, a review of its content reveals that only five of its 26 items specifically measure smoking motives (see Table 4). Two of these items fall under the *Stimulation Smoking* construct, one under *Psychosocial Smoking* and finally, two others under *Sensorimotor Smoking*. Similar to that observed with the RFS, the MFS is comprised

Table 2

Constructs and Item Content of the Reasons for Smoking Scale (RFS)

Reasons for Smoking Scale (RFS) : Constructs and Item Content	
Construct	**Item Content**
Stimulation Smoking	* I smoke cigarettes to stimulate me, to perk myself up. * I smoke cigarettes in order to keep myself from slowing down. * I smoke cigarettes to give me a lift.
Habitual Smoking	I've found a cigarette in my mouth and didn't remember putting it there. I smoke cigarettes automatically without even being aware of it. I light up a cigarette without realizing I still have one burning in the ashtray. I smoke cigarettes just from habit, without even really wanting the one I'm smoking.
Reduction of Negative Affect	When I am trying to solve a problem, I light up a cigarette. When I feel "blue" or want to take my mind off cares and worries, I smoke cigarettes. When I feel uncomfortable or upset about something, I light up a cigarette. I light up a cigarette when I feel angry about something. When I feel ashamed or embarrassed about something, I light up a cigarette. Few things help better than cigarettes when I am feeling upset.
Sensorimotor Smoking	When I smoke a cigarette, part of the enjoyment is watching the smoke rise as I exhale it. Part of the enjoyment of smoking a cigarette comes from the steps I take to light up. Handling a cigarette is part of the enjoyment of smoking it.
Pleasure Relaxation	I find cigarettes pleasurable. Smoking cigarettes is pleasant and relaxing.
Addictive Smoking	I am very much aware of the fact when I am not smoking a cigarette. I get a real gnawing hunger for a cigarette when I haven't smoked for a while. Between cigarettes, I get a craving that "only" a cigarette can satisfy. When I have run out of cigarettes I find it almost unbearable until I can get them. I do not feel contented for long unless I am smoking a cigarette.

* denotes those items that specifically measure smoking motivation

Table 3

Constructs and Item Content of the Occasions for Smoking Scale (OFS)

Occasions for Smoking Scale (OFS) : Constructs and Item Content	
Construct	**Item Content**
Nervous Irritation Smoking	Smokes when irritable Smokes when anxious or worried Smokes when angry Smokes in a break between jobs Smokes when bored Smokes when nervous
Relaxation Smoking	Smokes when watching TV Smokes when resting after exercise Smokes when reading a book Smokes when relaxing Smokes when happy
Smoking Alone	Smokes when alone Smokes when by self and feeling alone Smokes when feeling alone in a crowd Gets most pleasure smoking alone
Activity Accompaniment	Smokes when working hard Smoking when doing something interesting Smoking helps concentrate
Food Substitution	Smokes when feeling hungry * Smokes to keep slim * Smokes instead of eating sweets
Social Smoking	Smokes when drinking tea or coffee Smokes in company Smokes when talking Smokes most when staying in for the evening Smokes when drinking alcohol Smokes at a party Smokes most during the week
Social Confidence Smoking	Happier with smokers than non-smokers More self-confident with smokers group Feels more grown up when smoking (asked of adolescents only) More relaxed in a group when smoking Smoking gives something to do with hands in a

* denotes those items that specifically measure smoking motivation

Table 4

Constructs and Item Content of the Motives for Smoking Scale (MFS)

Motives for Smoking Scale (MFS) : Constructs and Item Content	
Construct	**Item Content**
Stimulation Smoking	I like smoking while I am busy and working hard. * Smoking helps to keep me going when I am tired. * Smoking cheers me up. I get a definite lift and feel more alert when smoking. I smoke more when I am rushed and have lots to do.
Indulgent Smoking	I want to smoke most when I am comfortable and relaxed. After meals is the time I most enjoy smoking. I like a cigarette best when I am having a quiet rest. I usually only smoke when I can really sit back and enjoy it.
Psychosocial Smoking	* I smoke for the pleasure of offering and accepting cigarettes from other people. I feel I look more mature and sophisticated when smoking. It is easier to talk and get on with other people when smoking. While smoking I feel more confident with other people. I smoke much more when I am with other people. I feel more attractive to the opposite sex when smoking.
Sensorimotor Smoking	Handling a cigarette is part of the enjoyment of smoking it. * I smoke for the pleasure of having something to do with my hands. Part of the enjoyment of smoking is watching the smoke as I blow it out. * I smoke because I like the smell so much.
Addictive Smoking	When I have run out of cigarettes I find it almost unbearable until I can get them. I am very much aware of the fact when I am not smoking. Without a cigarette I don't know what to do with my hands. I get a real gnawing hunger when I haven't smoked for a while.
Automatic Smoking	I smoke automatically without even being aware of it. I light up a cigarette without realizing I still have one burning in the ashtray. I find myself smoking without remembering lighting up.

* denotes those items that specifically measure smoking motivation

of an assortment of items measuring various facets of smoking behaviour, including the antecedents and consequences of smoking, the outcomes associated with not smoking, as well as the pleasure associated with smoking and finally, a few items which specifically measure motives for smoking.

In summary, this evaluation of smoking typology scales has identified a number of smoking motive constructs that influence the maintenance of smoking behaviour, including addiction, pleasure and relaxation, the management of negative affect, as well as sensorimotor manipulation, among others. When evaluated in terms of their item content, however, we have observed that smoking typology scales fail to measure smoking motives, despite claims to the contrary. In fact, when summed across the three scales, we find that only 10 items (12.2%) of a possible 82 actually measure smoking motives specifically. Given these findings, it is not surprising that the average correlation between scores on smoking typologies and actual smoking patterns in the natural environment is only .18 (Shiffman, 1993). Overall, these findings suggest that the scores obtained on smoking typology scales are not useful for making inferences about peoples' motivation for smoking.

3.3.2 Questionnaire on Smoking Urges

Research in the area of smoking urges and cravings has been thwarted by the lack of a psychometrically-sound measure of self-reported smoking cravings that is also sufficiently broad in content to address the various conceptualizations and theoretical formulations of the construct (Tiffany, 1990). In the absence of such a measure most researchers generally rely on one or two face-valid items, of undetermined reliability, which typically involve asking the respondent to rate their "craving .." or "desire to smoke" on some fixed-point rating

scale (West & Schneider, 1987; Willner, Hardman & Eaton, 1995). Although longer questionnaires have been developed, it has been suggested that their usefulness is restricted by a lack of information on their psychometric properties, their use of small validation samples and their underlying assumption that smoking cravings are a "manifestation of a unidimensional motivational state" (Tiffany & Drobes, 1991). The unidimensional conceptualization of craving reflects the theoretical tendency to regard smoking urges and cravings as originating directly from either the positive-reinforcing properties of smoking or the negative-reinforcing properties associated with the effects of withdrawal from nicotine (Willner, Hardman & Eaton, 1995).

Recently, Tiffany and Drobes (1991) developed a measure of smoking urges designed to overcome several of the above-noted limitations characteristic of its predecessors. One of the most significant departures from earlier developments is the expressed view that urges and cravings could be multidimensional rather than unidimensional entities (Tiffany & Drobes, 1991). In other words, rather than manifesting themselves as simply unidimensional motivational states, Tiffany and Drobes maintain that smoking urges and cravings are probably multifaceted, relating to both the positive and negative reinforcements contingent on smoking as well as complex cognitive structures and processes (1991).

Consistent with a multifactorial conceptualization, items for the *Questionnaire on Smoking Urges* (QSU) were generated to reflect four theoretically and clinically relevant formulations of smoking urges: (1) desire to smoke; (2) anticipation of positive outcomes from smoking; (3) anticipation of relief from nicotine withdrawal--associated negative affect; and (4) intention to smoke (Tiffany & Drobes, 1991). Table 5 presents the four

Table 5

Constructs and Item Content of the Questionnaire on Smoking Urges (QSU)

Questionnaire on Smoking Urges (QSU) : Constructs and Item Content		
Construct	**Item Content**	
Anticipation of Positive Outcome	Smoking a cigarette would not be pleasant. (-) Smoking now would make things seem perfect. A cigarette would not be very satisfying right now. (-) Nothing would be better than smoking a cigarette right now.	I would not enjoy a cigarette right now. (-) A cigarette would not taste good right now. (-) Smoking would make me happier now.
Relief from Withdrawal or Negative Affect	I would be less irritable now if I could smoke. Smoking would not help me calm down now (-) If I were smoking this minute, I would feel less bored. I would not feel better physically if I were smoking (-) smoke.	Smoking right now would make me less tired. Smoking would make me less depressed. If I were smoking now I could think more clearly. I could control things better right now if I could
Desire to Smoke	I am not missing smoking right now.(-) I don't want to smoke now. I crave a cigarette right now. I have an urge for a cigarette.	I need a smoke now. I have no desire for a cigarette now. (-) All I want right now is a cigarette. My desire to smoke seems overpowering.
Intention to Smoke	If I were offered a cigarette, I would smoke it immediately. Right now, I am not making plans to smoke. (-) Even if it were possible, I probably wouldn't's smoke now. (-) Starting now, I could go without smoking for a long time. (-) If I had a lit cigarette in my hand I probably wouldn't smoke it. (-)	I will smoke as soon as I get the chance. I am going to smoke as soon as possible. I would do almost anything for a cigarette right now.

Note: (-) denotes that these items are reverse keyed in the questionnaire

constructs and their respective items.

In terms of their relevance to our operational definition of smoking as a goal-directed behaviour, we find that only two of the four conceptual domains are specifically related to smoking motivation -- *Anticipation of Positive Outcomes* and *Relief from Withdrawal or Negative Affect*. These constructs are much broader in terms of their behavioural domain than that observed in our evaluation of smoking typologies. In fact, a review of the item content of *Anticipation of Positive Outcomes* reveals items which address the pleasure, enjoyment, taste, as well as positive affect associated with smoking. Similarly, *Relief from Withdrawal or Negative Affect* contains items which address the effects associated with the withdrawal from nicotine, stimulation as measured by relief from boredom and fatigue, as well as the reduction of negative affect. However, further review of the item content of these two constructs shows that not one of the items measures a smoking motive specifically.

3.3.3 Smoking Consequences Questionnaire

The original version of the Smoking Consequences Questionnaire (SCQ) was developed by Brandon and Baker in 1991, for use with college students. The overall aim in developing the SCQ was to facilitate research aimed at investigating the relationships between outcome expectancies and smoking behaviour. An additional goal in developing the questionnaire was to construct a measure of smoking-related expectancies that was free of the many limitations noted with respect to the Alcohol Expectancy Questionnaire and similar measures of alcohol expectancies (for a complete review see Leigh, 1989).

Paralleling the development of the original student version of the SCQ, Copeland, Brandon and Quinn (1995) developed a version of the expectancy questionnaire for use with

more experienced adult smokers. Consistent with theoretical models of drug outcome expectancies which postulate that expectancies become more specific and differentiated with experience, a principal components analysis conducted with data obtained from the SCQ-Adult yielded a ten-factor solution -- several more than the four-factor solution obtained with the original student version of the SCQ. The ten factors measured by the SCQ-Adult are: Negative Affect Reduction, Stimulation/State Enhancement, Health Risks, Taste-Sensorimotor, Social Facilitation, Weight Control, Craving/Addiction, Negative Physical Feelings, Boredom Reduction, and Negative Social Impression (Copeland, Brandon & Quinn, 1995). Table 6 presents the ten constructs and their respective item content.

When evaluated against our operational definition of smoking as a goal-directed behaviour, we find that three of the ten constructs measured by the SCQ do not measure smoking motivation. More specifically, the constructs *Negative Physical Feelings*, *Health Risk* and *Negative Social Impression* do not measure smoking motivation. Rather, *Negative Physical Feelings* and *Negative Social Impression* address the negative physical and social effects associated with smoking, whereas *Health Risk* measures knowledge of the health hazards associated with smoking. An examination of the item content of the remaining seven SCQ constructs (see Table 6) reveals that the majority of items indirectly measure one or more smoking motives. By measuring the consequences associated with smoking, the items of these relevant constructs indirectly measure the motives which underlie smoking behaviour. With some minor modifications, these items could be altered to measure smoking motives specifically.

Table 6

Constructs and Item Content of the Motives for the Smoking Consequences Questionnaire (SCQ)

Smoking Consequences Questionnaire -- Adult (SCQ) : Constructs and Item Content	
Construct	**Item Content**
Stimulation/State Enhancement	Smoking a cigarette energizes me. I feel better physically after having a cigarette. I feel like I do a better job when I am smoking. I like the way a cigarette makes me feel physically. Cigarettes can really make me feel good. When I'm feeling happy, smoking helps keep that feeling. A cigarette can energize me when I'm bored and tired.
Negative Affect Reduction	When I'm angry, a cigarette can calm me down. If I'm feeling irritable, a smoke will help me relax. When I'm upset with someone, a cigarette helps me cope. Cigarettes help me reduce or handle tension. When I am worrying about something, a cigarette is helpful. Smoking calms me down when I feel nervous. Cigarettes help me deal with anger. Cigarettes help me deal with anxiety or worry. If I'm tense, a cigarette helps me to relax.
Taste/ Sensorimotor Stimulation	I enjoy the taste sensations while smoking. I will enjoy the flavor of a cigarette. Cigarettes taste good. Just handling a cigarette is pleasurable. I enjoy feeling the smoke hit my mouth and the back of my throat. When I smoke, the taste is pleasant. I will enjoy feeling a cigarette on my tongue and lips. I enjoy the steps I take to light up. I like to watch the smoke from my cigarette.
Craving/ Addiction	Nicotine "fits" can be controlled by smoking. A cigarette can satisfy my urge to smoke. I will become more dependent on nicotine if I continue smoking Smoking temporarily reduces those repeated urges for cigarettes. Smoking will satisfy my nicotine cravings. I become more addicted the more I smoke.
Weight Control	Smoking keeps my weight down. Cigarettes keep me from overeating. Cigarettes keep me from eating more than I should. Smoking helps me control my weight. Smoking controls my appetite.

Table 6 Continued

Construct	Item Content	
Negative Physical Feelings	Cigarettes make my lungs hurt. My throat burns after smoking.	Smoking irritates my mouth and throat.
Social Facilitation	I feel more at ease with other people if I have a cigarette. I feel like part of a group when I'm around other smokers. Conversations seem more special if we are all smoking.	Smoking helps me enjoy other people more. I enjoy parties more when I am smoking.
Boredom Reduction	If I have nothing to do, a smoke can help kill time. When I'm alone, a cigarette can help me pass the time.	Cigarettes are good for dealing with boredom. When I feel bored and tired, a cigarette can really help.
Health Risk	Smoking is taking years off my life. By smoking I risk heart disease and lung cancer.	The more I smoke, the more I risk my health. Smoking is hazardous to my health.
Negative Social Impression	I look ridiculous while smoking. People think less of me if they see me smoking.	Smoking makes me seem less attractive.

3.4 Summary

This review of the literature suggests that smoking motivation is multidetermined: regular smokers are motivated to maintain their smoking behaviour by an identifiable number of specific constructs or motivational domains. Table 7 presents the smoking motivation constructs observed across the three perspectives.

In total, seven constructs were found to be related to our operational definition of smoking motivation. As Table 7 demonstrates, there is considerable overlap across the three perspectives. In fact, with the exception of *Sensorimotor Gratification*, *Social Image/Confidence* and *Weight Control*, which are shared by the smoking typologies and outcome expectancies viewpoints, all of the constructs are common to the three perspectives. This consistency serves to reinforce our understanding of the factors which influence motivation to maintain smoking behaviour. It should also be noted, however, that the literature review identified a greater number of constructs which were not related to our operational definition of smoking as a goal-directed behaviour. For the most part, with the exception of the *Habitual* and *Automatic* smoking constructs measured by the RFS and MFS, respectively, the discrepant constructs were not designed specifically to address smoking motivation. Their inclusion in the RFS and MFS, however, may explain, in part, the limited empirical and practical utility of these two smoking typology scales which purport to specifically measure smoking motivation.

Regarding content validity, our evaluation of the items which make up the seven relevant constructs has consistently demonstrated that very few items actually measure smoking motives specifically. In fact, of a total of 124 items comprising the seven constructs

Table 7

Constructs Consistent with the Operational Definition of Smoking Motivation

Constructs	Smoking Typologies	Questionnaire on Smoking Urges	Smoking Consequences Questionnaire
Addiction	Addictive	Relief from Withdrawal or Negative Affect	Craving / Addiction
Negative Affect Reduction	Negative Affect Reduction	Relief from Withdrawal or Negative Affect	Negative Affect Reduction
Pleasure / Relaxation	Pleasure and Relaxation	Anticipation of Positive Outcome	Stimulation / State Enhancement
Stimulation	Stimulation	Relief from Withdrawal or Negative Affect	Boredom Reduction
Sensorimotor Gratification	Sensorimotor Manipulation	_____	Taste / Sensorimotor Stimulation
Social Image / Confidence	Social Confidence	_____	Social Facilitation
Weight Control	Food Substitution	_____	Weight Control

only 12 or 9.7% were found to measure smoking motivation. Rather than measuring smoking motivation, this heterogeneous mix of items addresses the antecedents of smoking as well as the positive and negative consequences of smoking and abstinence.

This review of the literature makes two conclusions: (1) there are a number of identifiable factors which are presumed to motivate people to maintain their smoking behaviour and (2) there is currently no valid measurement tool published which comprehensively measures smoking motivation. As it concerns the former, seven smoking motive constructs were found to be common across the three different perspectives reviewed. Although their repeated observation lends support to their relevance and importance in the maintenance of smoking behaviour, it should be noted that there is not one validation study on regular daily smokers. Even if the smoking motive factors had been validated, the literature says nothing about either their clinical significance or their relative importance -- are we to assume that the smoking motives identified are equally important in the maintenance of smoking behaviour? Anecdotal evidence, however, may lead us to believe that the motive to satisfy a physiological craving for nicotine is more important in the overall maintenance of smoking behaviour than smoking for pleasure and relaxation, for instance. Unfortunately, the literature has not addressed this issue.

As it stands, research with available measurement tools would find it difficult to address the issue of the clinical significance and relative importance of smoking motive factors in the maintenance of smoking behaviour. Despite the identification of several constructs that were inconsistent with the operational definition of smoking motivation, the present review suggests that the main problem with existing scales appears to rest mostly

with the items and less with the relevance of their constructs. In other words, the main problem is not with the constructs that the scales want to measure but rather with the items which comprise the constructs. More specifically, it was demonstrated that the items which make up these instruments do not measure smoking motives but rather measure the situations in which people smoke. Measuring when people smoke is very different from measuring why they smoke.

Given that the primary issue is that the items poorly reflect our operational definition of smoking motivation, it makes sense that the first step in developing a valid and reliable measure of smoking motivation would involve the modification of the existing items which make up the seven relevant constructs identified. Such a modification will serve to increase the content validity and measurement precision of the items. Once an appropriate item pool is generated, the issues of clinical significance and relative importance can be explored so that in the end the measurement tool developed will consist of smoking motive constructs that are of both clinical and practical utility. Identifying the smoking motive factors that are central to the maintenance of smoking behaviour and developing a valid and reliable measurement tool of the same will provide health authorities with the information and tools needed to develop and evaluate the effectiveness of targeted intervention strategies.

3.5 Study Objectives

i. To generate a list of items that are consistent with the operational definition of smoking motivation and the specific constructs presumed to motivate smoking behaviour.

ii. To determine the relative importance of the smoking motive constructs identified.

iii. To construct a final list of items for the *Smoking Motives Inventory* that is characterized by constructs and items that are both clinically important and internally consistent.

iv. To assess the construct validity of the *Smoking Motives Inventory*.

v. To assess the internal consistency reliability of the *Smoking Motives Inventory*.

3.6 Methodological Overview

In order to address each of the objectives listed above, the present study proceeded along a series of logical steps. Specifically, the development of the *Smoking Motives Inventory* (SMI) occurred in four distinct stages and used a balance of psychometric and clinimetric approaches to scale construction. Historically, the two different approaches have been used in the development of multi-item health measurement tools (Feinstein, 1987; Wright & Feinstein, 1992). The different strategies and goals of the two approaches are highlighted below. For a comprehensive comparative contrast of the two philosophies the reader is referred to Wright and Feinstein (1992).

The domains of psychometrics and clinimetrics evolved to address different measurement goals (Feinstein, 1987). The older and more conventional of the two methodologies, psychometrics, originated from the fields of psychology and education. In general, the principal aim in psychometrics is to develop one or more homogeneous scales that measure a single attribute or characteristic of interest (Marx, Bombardier, Hogg-Johnson et al., 1999). To achieve this goal, psychometric strategies rely heavily on mathematical procedures such as factor analysis and principal components analysis to arrive at internally consistent or homogeneous scales. Clinimetrics, on the other hand, originated from the fields

of clinical medicine and epidemiology (Marx, Bombardier, Hogg-Johnson et al., 1999). Relying primarily on the judgements of clinicians and patients, the principal goal of clinimetrics is to develop a concise and clinically relevant measure of a clinical phenomenon believed to comprise several heterogeneous patient attributes or characteristics (Marx, Bombardier, Hogg-Johnson et al.,1999). The different methodological strategies of the psychometric and clinimetric approaches evolved to address different measurement goals and are appropriate to achieve these goals (Wright & Feinstein, 1992).

In terms of the steps involved in scale development both psychometrics and clinimetrics employ similar strategies for item generation. Items are generated that are consistent with the intended content or subject matter of the scale. The identification of conceptually relevant domains is based on a combined approach which usually includes a review of the relevant literature, input of expert opinion and an examination of existing scales, if there are any. The two approaches diverge, however, when it comes to item reduction and the grouping of items into domains or subscales, when necessary.

The purpose of item reduction is to eliminate redundant or inappropriate items thereby reducing the number of items to a total that is feasible to administer whilst ensuring that those retained reflect the construct or clinical phenomena of interest (Marx, Bombardier, Hogg-Johnson et al., 1999). This is especially important when the scale is to be used as a part of a test battery and respondent fatigue may negatively impact on item completion and accuracy. The clinimetric strategy to item reduction relies on the ratings of patients. Commonly, items are rank ordered according to their mean importance scores or mean combination scores (eg., importance-severity ratings or importance-frequency ratings) and

items with the poorest rankings are selected for elimination. The number of items eliminated is dependent upon the number of items in the initial item pool and the desired length of the final instrument. Retained items are then grouped into conceptually relevant domains, if appropriate, by clinicians based on intuition, informed by clinical and methodological experience (Marx, Bombardier, Hogg-Johnson et al., 1999).

One of the most commonly utilized techniques for item reduction in the psychometric approach is the use of factor analysis or principal components analysis. Factor analysis is a statistical procedure that relies on the patterns of covariation among items to determine both the groupings of items as well as their relative importance. Items that are correlated with one another but are independent of another set of items are grouped together into what is referred to as a factor or principal component. The manner in which items are grouped together are thought to reflect the underlying processes that created the observed correlations among the items (Stevens, 1996). Items with factor loadings (ie., correlation between the item and the factor) below the pre-defined criterion are excluded whereas those in excess of the criterion are retained. Stevens (1996) recommends the use of the critical values for simple correlations (alpha = 01: two-tailed test) which takes into consideration sample size to determine the significance of factor loadings.

There are strengths and limitations to both the clinimetric and psychometric approaches to scale development. Based on clinical judgement and patient ratings, the clinimetric approach builds clinical significance and practical utility into scale development. The limitation of this approach, however, is typically its lack of internally consistent scales and poor reproducibility. The psychometric approach, on the other hand, deliberately

excludes clinical judgement or reasoning in the grouping and ranking of items (Feinstein, 1987) in favour of relying on the statistical association among items. The strength of the psychometric approach is in its reproducibility and capacity to develop homogeneous, or internally consistent scales. The limitation, however, is that oftentimes the scales are not intuitively meaningful and may lack clinical or practical utility.

Consistent with our aim of developing a measure that is both clinically relevant and psychometrically sound, we employed a balance of the two methodological approaches. Both factor analytic procedures and clinical judgement were used throughout the development of the *Smoking Motives Inventory* to ensure that the resulting measure of important smoking motive constructs is characterized by homogeneous subsets of clinically relevant items. The use of a combination of psychometric and clinimetric approaches has recently been advocated by Marx et al., (1999) and others (Wright & Feinstein, 1992) working in the area of epidemiology and clinical medicine. The four specific stages of scale construction are outlined in Table 8.

The first stage of scale development involved the generation of an item pool for the inventory. The second stage involved assessing the factorial structure of the item pool as a means of validating both the smoking motive constructs and their respective items. Based on data gathered from a sample of 200 regular daily smokers, the third stage of development involved selecting items for inclusion in the inventory based on the use of both factor analytic strategies and importance ratings. Finally, the fourth stage of development involved an assessment of the construct validity and internal consistency reliability of the inventory.

Table 8

Four Stages in the Construction of the Smoking Motives Inventory

Stage 1 *Generation of an Item Pool*	**Stage 2** *Factorial Validity*	**Stage 3** *Construction of the SMI*	**Stage 4** *Psychometric Assessment*
- modification of existing items from existing questionnaires and generation of new items - preliminary validation of items by three smokers - expert evaluation of items for construct validity	- Smoking Motives Inventory completed by 200 regular daily smokers - data entry, screening and clean up -principal components analysis to assess how well the items perform in relation to their respective constructs	- establishment of a candidate list of items based on combination of clinical judgement and mathematical modelling: (1) mean importance score of 3.5 or greater; and (2) only non-complex items - principal components analysis for final selection of items based on (1) consistency in participant ratings; and (2) construct consistency - examination of relative importance and reliability of the identified smoking motive factors	- evaluation of the construct validity and internal consistency reliability of the data obtained with the Smoking Motives Inventory

4. STAGE 1: GENERATION OF AN ITEM POOL

The first step in developing the *Smoking Motives Inventory* was to generate a list of items that represented the seven smoking motive constructs identified in the literature review. An item pool of 54 items representing a wide range of possible smoking motives was developed by modifying existing items from the measurement tools previously evaluated and generating new items. A small number of regular daily smokers were involved in the preliminary evaluation of modified items drawn from the literature as well as in the generation of additional items. Further to this, four psychologists with expertise in the field of addiction and/or motivation evaluated the items in terms of their construct validity.

4.1 Preliminary Validation

Key informants are often used in scale development, particularly when little is known about the field of study (Streiner & Norman, 1995). Although there is no prescribed minimum for the number of people who should be interviewed, the criterion often used is "sampling to redundancy" (p. 17) or stated alternatively, interviewing until no new themes emerge (Streiner & Norman, 1995). Consistent with this approach, in-depth interviews lasting between 30 minutes and one hour were conducted with three regular daily smokers for the purpose of providing a preliminary validation of the seven smoking motive constructs and an initial evaluation of the items in terms of their interpretation, comprehensiveness and face validity. Two females and one male were interviewed -- one female was a family member of the principal investigator whereas the two others were friends. All three were aware of the investigation and volunteered to participate. The mean number of years smoked was 25.7 with a range of 15 to 43 years.

Regarding the comprehensiveness of items, interviewees were provided the list of items and were instructed to examine them to ensure that the list captured all of the reasons why they maintain their smoking behaviour. In evaluating the comprehensiveness of the items, the first smoker interviewed noted that not one of the items in the item pool addressed the concept of "*smoking identity*". This person told us that one of the reasons why she continued to smoke was that "*She was a smoker and smoking was a part of her identity*". Although a smoking identity construct had not been identified in the literature, it was felt that it should be included for exploratory purposes. In consultation with this individual, nine additional items were developed to measure this exploratory smoking motive construct. The new construct and its items were supported by the two other interviewees. The addition of the smoking identity construct raised the total number of items in the item pool to 63. As no more smoking motive constructs were identified, the recruitment of additional key informants was not deemed necessary.

In addition to assessing the items for understandability and comprehensiveness, interviewees were also involved in the development of the instructional set for the inventory. Specifically, the interviewees were provided with five different instructional sets and were asked to select the one that they felt was the most clearly worded and understandable. Ensuring that instructions are clear and understandable to those for whom the instrument is intended is especially important in self-administered scales and questionnaires.

4.2 Expert Evaluation

Each of the items in the item pool was subsequently evaluated by four psychologists with expertise in the field of addiction and/or motivation in terms of their construct validity.

The purpose of this evaluation was twofold: (1) to retain those items which most strongly corresponded to our operational definition of smoking motivation and (2) to reduce the total number of items in the item pool by eliminating redundant and/or biased items.

To this end, these four raters completed the *Expert Evaluation Questionnaire: Construct Validity* (Appendix A) wherein which they were instructed to rate each of the items on a five-point Likert scale according to how well they corresponded to the operational definition of smoking motivation (1 "*does not correspond at all*" to 5 "*corresponds very well*"). To facilitate the task, items were categorized according to the smoking motive they represented and operational definitions were provided that were motive-specific. Final item scores were determined by calculating the mean of the three highest ratings. Items were retained if they had a mean rating of 4.0 or greater. The use of such a rigorous criterion for item inclusion was justified to ensure that only the most relevant items would be retained. In total, 44 items (70%) met the minimum criteria for inclusion. Expert ratings for all of the items evaluated are presented in Appendix B.

In order to obtain an equal number of items (N = 5) for each of the eight smoking motive constructs it was necessary to either exclude or create additional items. The decision to select five items per smoking motive construct was made in an effort to strike a balance between the need to identify and eliminate poorly functioning items while simultaneously not overburdening the respondent with an excessively long questionnaire. In instances where the smoking motive contained more than five items, excess items were excluded on the basis of an evaluation of their mean rating score and their redundancy with the remaining items. On the other hand, where the smoking motive construct contained fewer than five items,

additional items were created by modifying an appropriate number of the remaining items. The comments and suggestions of the expert consultants were used as a guide to determine which items should be included and how they should be revised. The final list of 40 items assembled according to their respective smoking motive is presented in Table 9.

Table 9

Final List of Items by Smoking Motive

Addiction

to reduce the physical discomfort I feel when I have been without a cigarette for too long
to satisfy a craving for a cigarette
to reduce the tension I feel when I have not smoked for a while
to satisfy my addiction to nicotine
to reduce the irritability I feel when I have not had a cigarette for a while

Reduction in Negative Affect

to calm myself down when I am feeling angry
to reduce feelings of anxiety
to cope with stress
to feel better when I am upset
calm my nerves when I am feeling nervous

Pleasure and Relaxation

to relax
to increase feelings of well-being
to feel a sense of pleasure
to feel the satisfaction a cigarette gives me
to wind down

Sensory & Sensory-Motor Gratification

to enjoy the taste of cigarettes
to get the satisfaction of watching the smoke rise
to get the satisfaction of handling a cigarette
to get the satisfaction of having something to do with my hands
to feel the satisfaction of lighting a cigarette

Stimulant Smoking

to concentrate
to think more clearly
to relieve feelings of boredom
to focus my attention
to get energy when I need a boost

Social/Social Confidence

to feel accepted by other people who smoke
to avoid feeling left out by my friends who smoke
to feel less alone in a crowd
to feel more self-confident around other people
to feel more relaxed around other people

Weight/Appetite Control

to avoid gaining weight
to avoid gaining more weight
to feel less hungry
to reduce the urge to snack
to keep slim

Smoking Identity

because smoking is consistent with my image of myself
because other people know me as a smoker
because it is part of who I am
because I would not feel like myself unless I smoked
because I see myself as a smoker

5. STAGE 2: FACTORIAL VALIDITY

The second stage in developing the *Smoking Motives Inventory* involved assessing the factorial validity of the smoking motive items as defined by our eight smoking motive constructs. To this end, the 40 item inventory (labelled the *Smoking Motives Inventory* in the questionnaire) was completed by 200 regular daily smokers. Regular daily smokers were operationally defined as individuals aged 18 and older who currently smoke at least one cigarette per day and have done so for a minimum period of one year. This definition is consistent with that employed by Statistics Canada in its determination of regular daily smokers. In completing the SMI, respondents were instructed to rate each of the items in terms of how important (1 "*not at all important*" to 7 "*extremely important*") each reason for smoking was to them. Our sample of 200 smokers was deemed sufficient to meet the demands of the planned analyses. As a rule of thumb, principal components analysis requires a minimum of five subjects per variable for reliable factors (Stevens, 1996).

Exploratory factor analysis was employed to assess how well the items performed in relation to their respective constructs. More specifically, principal components analysis was chosen because it is a psychometrically sound procedure (Stevens, 1996). In principal components analysis the variables are transformed into linear combinations referred to as principal components (Stevens, 1996). An alternative strategy would have been to use confirmatory factor analysis where the objective of the researcher is to "confirm" a hypothesized factor structure with the data (Stevens, 1996). However, in order for confirmatory factor analysis to be appropriate, the researcher must know *a priori* how many factors there are and whether or not they should be correlated. Comparisons between the

hypothesized factors and the obtained factor solution provide a test of the hypotheses generated. Both the constructs and items for the present study were derived from the examination of three different theories -- constructs that were consistent with our operational definition of motivation were retained whereas those that were not were excluded. The result is a set of constructs that does not reflect any of the original theories from which they were derived. Further, the interrelations among the constructs have not been previously explored, and confirmatory factor analysis is justified when one is working from a solid theoretical or empirical base. Consequently, it was decided that the research on the SMI had not yet progressed to the point where confirmatory factor analysis was appropriate.

5.1 Method

5.1.1 Sample

This segment of the study uses data gathered from 200 regular daily smokers from across Ontario (77%) and parts of Alberta (14%) and Quebec (5%). Four percent were missing postal code data and could not be geographically assigned to a specific province. Over two thirds (N = 134 or 67%) of respondents were female whereas 32.5% (N = 65) were male. One respondent was missing data for gender. The mean age of respondents was 41.6 years (sd = 6.6 years). Respondents reported having completed between six and 22 years of schooling with a mean educational attainment of 14.3 years.

In terms of their smoking profile, respondents reported currently smoking, on average, 18 cigarettes per day (range: 3 to 50 cigarettes). The mean age for having started smoking was 16 years (sd = 4.4 years). Just over half of all respondents (54.5%) reported that they had, at one time, asked their doctor or pharmacist for information on medication to help quit

smoking. The vast majority of respondents (177 or 88.5%) reported having attempted to quit smoking at least once. The mean number of reported quit attempts was 3.8 with a standard deviation of 3.98. Among those who had attempted to quit smoking, 31.1% reported having used the nicotine patch, whereas 30.5% and 23.7% reported having used nicotine gum and zyban, respectively. Further to this, 23.2% reported having participated in a formal smoking cessation program. Clearly this was a sample characterized by at least some degree of desire to quit smoking, but who had been unsuccessful. These results are also presented in tabular form in Appendix C.

Respondents were also classified according to the stages of change of the Transtheoretical Model (Prochaska & DiClemente, 1983). Developed through extensive studies of smoking, the Transtheoretical Model views behavioural change as a process involving progress through five stages, namely precontemplation, contemplation, preparation, action, and maintenance (Prochaska & DiClemente, 1983). In the *precontemplation* stage smokers have no intention of taking action to change their behaviour in the foreseeable future (ie., next six months). In the *contemplation* stage, however, smokers intend to take action in the next six months but are very much aware of the cons associated with such a change. Finally, in the *preparation* stage, smokers intend to take action to change their behaviour in the immediate future, typically measured as within the next month. As all respondents were current smokers none were in either the *action* or *maintenance* stages. The distribution of respondents according to the three relevant stages was: 36% *precontemplation*; 36% *contemplation*; and 28% *preparation*. These findings are consistent with the previously determined distributions of 40%, 40% and 20%, respectively,

for *precontemplation, contemplation* and *preparation* based on numerous staging studies among smokers with samples ranging from several hundred to more than 20,000 (Glanz, Lewis & Rimer, 1997).

5.1.2 Procedure

Data for this portion of the study were collected through community-based tobacco reduction programs throughout Ontario and parts of Alberta. Questionnaire packages were distributed to health care practitioners who participated in one of several *Minimal Contact Interventions for Smoking Cessation* workshops conducted by Dr. Stephen Hotz and Janet Carr. Workshop attendees included family physicians and public/occupational health nurses, dental hygienists/assistants, as well as addiction counsellors and tobacco prevention educators. Attendees interested in participating were instructed to distribute the questionnaire packages to their clients or patients who smoked. Each study package contained a study information/consent form (Appendix D) and the self-administered *Smoking Motivation Questionnaire* (Appendix E) as well as a postage-paid business-reply envelope. Respondents were instructed to mail their completed questionnaires back to the principal investigator in the envelopes provided. For those health care practitioners who participated in one of the workshops conducted prior to the start of the data collection period (N = 197), a package containing a cover letter describing the study and four questionnaire packages were mailed to them. These participants were requested to distribute the questionnaire packages to four of their clients or patients who smoked. Over the course of the data collection period (May to August 2000, inclusively), 1150 questionnaires were distributed. By the end of the data collection period, 200 valid questionnaires had been returned. Three

additional questionnaires were returned but were excluded because they had not been completed. Because it is not known how many questionnaire packages were actually distributed to eligible smokers it is not possible to determine the true response rate for the study. The investigation was granted approval from the Research Ethics Board of the Loeb Health Research Institute at the Ottawa Hospital.

5.2 Results

5.2.1 Conditioning Matrices: Data Screening and Clean Up

Data entry and analysis were completed by the principal investigator. All analyses were performed using SPSS. Eighteen cases were missing data on one or two of the SMI items. Examination of the distribution of missing values on the SMI did not reveal any systematic pattern. To maximize the number of cases available for analysis, mean item scores were imputed for cases with missing values. Inserting mean values is a conservative approach for dealing with missing data as the mean of the distribution of the affected variable remains unchanged (Tabachnik & Fidell, 1983). This approach is not recommended for data sets with a considerable number of missing values on a variable as the correlations between the variable with a mean inserted in several slots and other variables will be reduced which could have an effect on multivariate procedures which are sensitive to slight changes in correlation coefficients (Tabachnik & Fidell, 1983).

An examination of the descriptive statistics (see Appendix F) revealed that the majority of SMI items (N=36) were characterized by significantly skewed distributions. Ten distributions were negatively skewed whereas the remaining 26 distributions were positively skewed. Although assumptions regarding the normal distribution of variables are not in

force when principal components analysis is used as a descriptive tool to summarize the relationships among variables, the factor solution may be degraded to the extent that normality fails (Tabachnik & Fidell, 1983). To permit analysis of the potential impact of the skewed distributions on the principal components analysis, the distributions were transformed using the log base 10 transformation. Negatively skewed distributions were reflected prior to transformation. The log base 10 transformation was selected as it consistently performed the best compared to the other transformation methods (e.g., square root and natural log). To ensure interpretability, it was necessary that the same transformation be applied equally to all of the distributions. Although the transformation did not normalize all distributions it did reduce the magnitude of the skew in those that remained significantly skewed.

5.2.2 Principal Components Analysis

The goal of principal components analysis (PCA) is to extract the maximum amount of variance from the data with each component or linear combination of variables (Stevens, 1996; Tabachnik & Fidell, 1983). The first principal component is the linear combination of variables that maximally separates respondents by maximizing the variance of their component scores (Tabachnik & Fidell, 1983). Subsequent components are extracted from the residual correlations and are orthogonal to all previously extracted components (Tabachnik & Fidell, 1983). Following extraction, rotation is used to improve the interpretability and utility of the solution. The researcher has the choice between orthogonal and oblique rotations. In orthogonal rotation, the components are uncorrelated which enhances the interpretation, description and reporting of results (Tabachnik & Fidell, 1983).

In oblique rotation, components may be correlated. Although this may offer conceptual advantages, it has practical costs to the researcher in terms of interpretability (Tabachnik & Fidell, 1983). For the ease of interpretation, an orthogonal rotation was utilized in the present analyses. Specifically, the varimax rotation was selected. Of the three orthogonal rotation techniques (varimax, quartimax & equamax), the varimax is the most commonly used (Tabachnik & Fidell, 1983). In varimax rotation, components are simplified as the variance of the loadings is maximized both within the components and across variables (Tabachnik & Fidell, 1983). In other words, the distribution in factor loadings is maximized so that high loadings after extraction become higher and low loadings become lower. Interpretation of the factor solution following rotation is facilitated as it is obvious which variables correlate or load on a particular factor and which do not.

Principal components analyses with Varimax rotation were performed on the original and transformed SMI items. Essentially, identical factor solutions were obtained with both sets of items. Further to this, the solution obtained with the transformed items only increased the proportion of variance explained by 2% indicating that the solution with the original variables was not appreciably degraded despite the failure in normality. Given the equivalent findings only the results for the principal components analysis utilizing the untransformed items is presented here.

Factorability of the correlation matrix was assessed through the size of the correlation coefficients in the matrix, the KMO measure[c] and the Bartlett test of Sphericity[d]. As required,

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[c] The KMO measure is an index for comparing the magnitudes of the observed correlation coefficient to the magnitude of the partial correlation coefficients. The KMO index varies between 0 and 1.0. A KMO of .50 or greater is indicative that factor analysis is appropriate (Stevens, 1996).

several of the correlation coefficients in the matrix were found to be over .30. The KMO measure was .83, well above the minimum recommended value of .50 (Tabachnik & Fidell, 1983). The Bartlett test of Sphericity produced significant results ($p<.00001$). In addition, the measures of sampling adequacy (MSA)[c] were all reasonably large ($\geq .64$) and the values of the off-diagonals in the anti-image correlation matrix were small. Thus, one can conclude that the correlation matrix was appropriate for principal components analysis.

The principal components analysis resulted in the extraction of eight factors with eigenvalues greater than 1.0 (see Table 10). Cumulatively, the eight factors accounted for 65% of the variance. Only one item "*Sometimes I smoke to get energy when I need a boost*" failed to load significantly on any of the factors. Six items were found to be complex items, that is, they loaded significantly on more than one factor. Interestingly, the *Smoking Identity* and *Social/Social Confidence* items loaded together to form one factor (*Social Confidence/Identity*). This is not surprising given the conceptual interdependence of two constructs -- that is, one's identity or self-concept may be considered the result of an ongoing and complex integration of generalizations about oneself and our perceptions of the impressions and evaluations that other people have of us in our daily interactions with them. To the extent that our behaviour or image is consistent with our own self-concept and that

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[d]The Bartlett test of Sphericity is a statistical index used to test if the correlation between variables is significant. Essentially, this index is used to test the null hypothesis that the correlation matrix is an identity matrix – that is, all diagonal values are 1 and all off-diagonals are 0. Significant results at alpha .05 indicate that factor analysis is appropriate (Stevens, 1996).

[c]Kaiser's MSA is a ratio of the sum of squared correlations to the sum of squared correlations plus the sum of squared partial correlations. The value approaches 1.0 if partial correlations are small. Values of .6 or greater are required for good factor analysis (Tabachnick & Fidell, 1983).

Table 10

Factor Loadings and Mean "Importance Scores" of Variables for Principal Components Analysis Factor Extraction with Varimax Rotation of Eight Factors

SMI Items		Rotated Factor Loadings
Negative Affect		
to calm myself down when I am feeling angry		.831
to calm my nerves when feeling anxious		.821
to reduce feelings of anxiety		.804
to feel better when I am upset		.797
to cope with stress		.729
to wind down		.643
*to relax		.562
*to reduce the irritability I feel when I have not had a cigarette in a while		.407
	Mean (4.78)	***Eigenvalue (8.13)***
Social Confidence and Identity		
because people know me as a smoker		.773
because it is consistent with my image of myself		.737
because I see myself as a smoker		.730
because it is a part of who I am		.707
because I would not feel like myself unless I smoked		.595
to avoid feeling left out by friends who smoke		.592
to feel accepted by other people who smoke		.563
to feel more self-confident around other people		.506
to feel more relaxed around other people		.417
	Mean (1.74)	***Eigenvalue (5.16)***
Appetite/Weight Control		
to avoid gaining weight		.889
to avoid gaining more weight		.885
to feel less hungry		.879
to reduce the urge to snack		.846
to keep slim		.703
	Mean (2.89)	***Eigenvalue (3.98)***
Addiction		
to satisfy my addiction to nicotine		.793
to reduce the tension I feel when I have not smoked for a while		.791
to satisfy a craving for a cigarette		.758
*to reduce the irritability I feel when I have not had a cigarette in a while		.758
to reduce the physical discomfort I feel when I have not smoked for a while		.743
	Mean (4.69)	***Eigenvalue (2.43)***

SMI Items		Rotated Factor Loadings
Stimulation		
to focus my attention		.826
to think more clearly		.819
to concentrate		.769
*to feel more self confident around other people		.422
to increase feelings of well-being		.406
	Mean (2.54)	***Eigenvalue (2.04)***
Sensory Motor		
to get the satisfaction of handling a cigarette		.708
to feel the satisfaction of lighting a cigarette		.666
to get the satisfaction of watching the smoke rise		.657
to feel less alone in a crowd		.529
*to get the satisfaction of having something to do with my hands		.441
*to feel more self confident around other people		.382
	Mean (2.22)	***Eigenvalue (1.74)***
Pleasure and Relaxation		
to enjoy the taste of cigarettes		.705
to feel a sense of pleasure		.688
*to feel the satisfaction a cigarette gives me		.555
*to relax		.390
*to feel the satisfaction of lighting a cigarette		.364
	Mean (3.80)	***Eigenvalue (1.26)***
Distraction		
to relieve feelings of boredom		.760
*to get the satisfaction of having something to do with my hands		.623
	Mean (3.39)	***Eigenvalue (1.24)***

Note: Only factor loadings greater than or equal to 0.364 have been presented. Cumulatively, the eight factors account for 65% of the variance. * Represents items with significant cross-loadings.

we perceive to be held by those we interact with, we feel a sense of social confidence.

As Table 10 demonstrates, the factors closely resemble the smoking motive constructs identified as relevant thus validating the initial stage of scale development. In proceeding to the next stage, that of item selection, we may then feel confident that the items generated appropriately reflect the smoking motive constructs identified in the literature to be relevant to the maintenance of smoking.

6. STAGE 3: CONSTRUCTION OF THE SMI

The next step in the process of constructing the SMI involved the selection of items for inclusion in the final measure. In the construction of a measurement tool decisions must be made concerning how items will be assessed for retention in the final instrument. According to Feinstein (1987), there are three general approaches to item retention: (1) clinical judgement, (2) mathematical modelling and (3) a combined form of clinical and statistical judgement. In the clinical judgement approach a variety of strategies can be used for determining item retention, such as professional experience, patient ratings, and consensus of authorities (Feinstein, 1987). However, being purely judgmental decisions are made without supporting empirical evidence. At the other end of the spectrum, mathematical models, such as principal components analysis and factor analysis, rely solely on the mathematical attributes of the items to determine their relative importance. Consistent with our primary goal of developing a measure of smoking motivation that is both psychometrically sound and clinically relevant we chose to adopt the more balanced approach of clinico-statistical judgment (Feinstein, 1987).

6.1 Item Reduction: Establishing a Candidate List

Consistent with the combined clinico-statistical judgement approach, both clinical judgement and mathematical modelling were used to arrive at a list of candidate items and to select which among those would be retained in the final inventory. To be eligible for inclusion on the candidate list, items had to meet two specific criteria: (1) in the first principal components analysis items had to have loaded significantly on only one factor, and (2) items had to have a mean "importance" score of 3.5 or greater. Table 11 presents the

mean "importance" scores for all those items which met the first criterion as specified above.

Consistent with the clinimetric approach to item reduction, a mean "importance" score was calculated for each item based on participants' responses on the *Smoking Motives Inventory*. It will be recalled that in completing the measure, participants were instructed to rate on a scale from 1 "*not at all important*" to 7 "*extremely important*" how important each reason for smoking was to the maintenance of their smoking behaviour. A cutoff of 3.5 was utilized as it represents the mid-point on the response scale. As shown in Table 11, a total of 13 items from four constructs met the minimum criteria for inclusion on the candidate list for final item selection.

6.2 Item Retention: The Final Selection of Items

Having generated a candidate list, the next step in the construction of the SMI involved the final selection of items. To be eligible for inclusion in the final inventory, candidate items were required to demonstrate statistical evidence of (1) consistency in participant ratings and (2) construct consistency. Stated differently, an item would be considered to have demonstrated statistical evidence of consistency in participant ratings and construct if, following principal components analysis, it loaded significantly on the factor it was intended to belong to. It will be recalled that in stage one of scale development, items were evaluated by four experts in terms of how well they corresponded to the motive-specific operational definition of smoking motivation. For reference purposes, the items presented by intended smoking motive construct are presented in Table 9.

A principal components analysis was conducted on the 13 candidate items using the

Table 11

Candidate List of Items

SMI Items and Factors	Mean "Importance" Scores
Addiction	
to satisfy a craving for a cigarette	5.60
to satisfy my addiction to nicotine	4.95
to reduce the tension I feel when I have not smoked for a while	4.57
to reduce the physical discomfort I feel when I have not smoked for a while	4.22
Negative Affect	
to calm myself down when I am feeling angry	4.92
to calm my nerves when I am feeling anxious	4.91
to cope with stress	4.85
to reduce feelings of anxiety	4.83
to feel better when I am upset	4.68
to wind down	4.61
Pleasure and Relaxation	
to feel a sense of pleasure	3.96
to enjoy the taste of cigarettes	3.56
Distraction	
to relieve feelings of boredom	3.65

same sample. Three factors with eigenvalues greater than 1.0 were extracted. All of the items had factor loadings of .461 and over, well above the critical value (alpha .01: N = ~200) of .364 (see Stevens, 1996). However, examination of the factors revealed that two items "*Sometimes I smoke to relieve feelings of boredom*" and "*Sometimes I smoke to wind down*" loaded on factors other than those they were intended to belong to. Excluding these two items, the three factors were defined exclusively by the *Reduction in Negative Affect, Addiction* and *Pleasure and Relaxation* items, respectively. The three factors accounted for a cumulative total of 63.5%. Factor loadings of the items are presented in Table 12.

Factorability of the correlation matrix was assessed through the size of the correlation coefficients in the matrix, the KMO measure and the Bartlett test of Sphericity. Several of the correlation coefficients in the matrix were found to be over .30, however, none were perfect or near perfect with the highest correlation observed being .75 . The KMO measure was .87, well above the minimum recommended value of .60 (see Stevens, 1996). The Bartlett test of Sphericity produced significant results ($p<.00001$). In addition, the measures of sampling adequacy (MSA) were all reasonably large ($\geq .61$) and the values of the off-diagonals in the anti-image correlation matrix were small. Thus, one can conclude that there was no problem of multicollinearity and the correlation matrix was appropriate for principal components analysis. Furthermore, the sample size was adequate with a ratio of 15.1 cases per item.

Table 12

Factor Loadings of Variables for Principal Components Analysis Factor Extraction with Varimax Rotation of Three Factors

SMI Items	Rotated Factor Loadings
Reduction in Negative Affect	
to calm my nerves when I am feeling anxious	.843
to reduce feelings of anxiety	.829
to calm myself down when I am feeling angry	.822
to feel better when I am upset	.814
to cope with stress	.772
	Eigenvalue (5.22)
Addiction	
to satisfy my addiction to nicotine	.828
to reduce the tension I feel when I have not smoked for a while	.805
to satisfy a craving for a cigarette	.740
to reduced the physical discomfort I feel when I have not smoked for a while	.658
	Eigenvalue (1.64)
Pleasure and Relaxation	
to feel a sense of pleasure	.760
to enjoy the taste of cigarettes	.741
	Eigenvalue (1.39)

Note: Only factor loadings greater than or equal to 0.364 have been presented. Cumulatively, the three factors account for 63.5% of the variance. Variables with significant cross-loadings are not presented here.

6.3 Relative Importance and Reliability of the Smoking Motive Factors

The relative importance of the defined factors was determined by comparing the three factors in terms of their mean "importance" scores. The results indicated that both the *Reduction in Negative Affect* and *Addiction* factors were equivalent in importance with mean scores of 4.84. The *Pleasure and Relaxation* factor ranked lower with a mean importance score of 3.76. These results provide additional support for the practical significance of the three factors.

According to a Monte Carlo study conducted by Guadagnoli and Velicer in 1988, the reliability of a factor is a function of the number of variables, the magnitude of their factor loadings and the absolute sample size. Based on their recommendations, factors with four or more loadings above .60 should be considered reliable regardless of sample size. In examining the composition of our three factors, we see that both the *Reduction in Negative Affect* and *Addiction* factors satisfy this criterion for reliability. Unfortunately, the same cannot be said for the *Pleasure and Relaxation* factor which consists of only two items. Though the factor loadings for the two items are relatively high (> .74), the reliability of the factor cannot be empirically determined (Stevens, 1996). In fact, it could be argued that a factor defined by only two items is not much of a factor (Stevens, 1996). In terms of the ongoing development of the *Smoking Motives Inventory* the factor will be retained for further development and exploration. However, for the purpose of psychometric assessment, the factor will be excluded.

7. STAGE 4: PSYCHOMETRIC ASSESSMENT

The fourth stage of the investigation involved examining the psychometric properties of the *Reduction in Negative Affect* and *Addiction* subscales of the *Smoking Motives Inventory*. More specifically, this portion of the study examined the construct validity and internal consistency reliability of the data obtained with the scale. Construct validity was assessed by examining the relationship between the two subscales and other variables of interest, whereas reliability was assessed by three recommended measures of internal consistency reliability. All analyses were undertaken using the original sample data.

7.1 Construct Validity

Establishing the validity of the data obtained from a given scale without a gold standard to which to compare is conceptually difficult. In such circumstances, an alternative method is to examine the construct validity of the scale wherein which hypotheses are formulated concerning expected relationships between scores on the measure and other variables of interest. For the purposes of the present evaluation, the relationship between scores on the two SMI subscales and self-reported measures of nicotine dependence and degree of confidence to function under stress while abstinent from smoking were examined.

7.1.1 Measurement of Nicotine Dependence

The *Fagerström Tolerance Questionnaire* (Fagerström, 1978) was utilized as a measure of nicotine dependence. This standard self-report questionnaire has been used extensively as a measure of nicotine dependence and tolerance. With the exception of the first item, which measures the number of cigarettes smoked per day, the original open-ended response format was modified to a multiple choice format to facilitate scoring. The response

alternatives chosen, however, are consistent with the scoring instructions of the questionnaire. Consistent with past research two items were deleted from the questionnaire (for example, Brandon & Baker, 1991). Specifically, the item measuring how often respondents inhaled and the item concerning the brand of cigarettes smoked were deleted. Our revised version of the questionnaire has a range of 1-8 points, with a score of 1 indicating minimal dependence and a score of 8 indicating maximum physical dependence. The mean dependence score for the sample was 3.5 (sd = 1.7). Fifteen cases were missing data on this composite variable. It was hypothesized that scores on the *Addiction* subscale would correlate significantly and positively with scores obtained on the Fagerström Tolerance Questionnaire as both measures address nicotine dependence.

7.1.2 Measurement of Confidence to Function under Stress While Abstinent

One item "*How confident are you that you could function under stress without smoking*" was used to assesses participant's confidence in their ability to function under stress while remaining abstinent. Confidence was measured on a seven point Likert scale ranging from 1 "*not at all confident*" to 7 "*very confident*". The mean confidence score for the sample was 4.0 with a standard deviation of 1.7. Two cases were missing data for this item. It was hypothesized that scores on the *Reduction in Negative Affect* subscale would correlate significantly and negatively with scores on the confidence measure. In other words, we predicted that people who smoke to manage or reduce negative emotions will report lower levels of confidence to function under stress while remaining abstinent.

7.1.3 Results

Examination of the correlation matrix (see Table 13) revealed that both hypotheses

Table 13

Intercorrelations among SMI Subscales and Variables of Interest

CORRELATION MATRIX WITH NUMBER OF CASES					
	NAFFECT	ADDICTION	FAGERSTROM	CIGARETTES/ DAY	STRESS
NAFFECT		196	184	194	195
ADDICTION	.48***		184	194	195
FAGERSTROM	.21*	.43***		185	185
CIGARETTES/ DAY	.14	.34***	.62***		196
STRESS	-.37***	-.35***	-.24**	-.30***	

Note: Figures on the upper diagonal represent number of cases available for analysis whereas figures on lower diagonal represent Pearson Correlation Coefficients.

* $p \leq .004$; * * $p \leq .001$; **** $p \leq .0001$

NAFFECT: SMI Subscale (Reduction in Negative Affect)
ADDICTION: SMI subscale (Addiction)
FAGERSTROM: Fagerstrom Tolerance Questionnaire
CIGARETTES/DAY: Average number of cigarettes smoked per day
STRESS: Confidence in ability to function under stress while not smoking

were supported. More specifically, a significant positive correlation of .43 ($p < .001$) was observed between scores on the *Addiction* subscale and scores on the Fagerström measure of physical dependence and a significant negative correlation of -.37 ($p < .001$) was observed between scores on the *Reduction in Negative Affect* subscale and the measure of participants' confidence to function under stress without smoking.

In addition, the two SMI subscales were found to be significantly correlated ($r = .48$; $p < .001$) accounting for 23.2% of the common variance. Combined, these results provide initial support for the construct validity of the *Smoking Motives Inventory*.

7.2 Internal Consistency Reliability

Three measures of internal consistency were examined to determine the internal consistency reliability of the SMI and its subscales. Specifically, coefficient alpha reliabilities as well as item-remainder and mean inter-item correlations were assessed. Taken together, the reliability analyses revealed highly satisfactory levels of internal consistency.

7.2.1 Coefficient Alpha Reliabilities

Coefficient alpha, also known as Cronbach's alpha, is a measure of a scale's internal consistency or more precisely the consistency of responses to all items or subscale items on a given test (Chronbach, 1951). A very high degree of internal consistency (.91) was observed for the *Reduction in Negative Affect* subscale. The coefficient alpha reliability for the *Addiction* subscale also indicated a high degree of internal consistency (.81).

7.2.2 Item-Remainder and Mean Inter-Item Correlations

Item-remainder and mean inter-item correlations measure the degree to which an individual item correlates with the total score omitting that item (the item is excluded from

the total so as to avoid an artificially inflated correlation) and the degree to which items are correlated to one another, respectively (Streiner & Norman, 1995). Table 14 presents the reliability coefficients for each of the SMI subscales.

Item-remainder correlations for the *Addiction* subscale ranged from .70 to .81, whereas correlations for the *Reduction in Negative Affect* subscale ranged from .87 to .89. Examination of the item correlations for the *Addiction* subscale revealed that the standardized alpha coefficient would increase very slightly if the item "*to reduce the physical discomfort I feel when I have not smoked for a while*" was deleted. Retaining the item, however, is justified given the short length of the subscale. Its inclusion provides a certain degree of confidence that the internal consistency reliability of the scale will not drop below acceptable levels when used with another sample (DeVellis, 1991). Mean inter-item correlations for the two subscales were .51 and .66 for the *Addiction* and *Reduction in Negative Affect* subscale, respectively.

Table 14

Corrected Item-Remainder Correlations, Mean Inter-Item Correlations and Alpha Coefficients for the Two SMI Subscales

Corrected Item-Remainder Correlations for SMI Subscales	
Reduction in Negative Affect Items	
to calm my nerves when I am feeling anxious	.87
to calm myself down when I am feeling angry	.89
to reduce feelings of anxiety	.89
to feel better when I am upset	.89
to cope with stress	.89
mean inter-item correlation	**.66**
standardized item alpha	**.91**
alpha coefficient	**.91**
Addiction Items	
to reduce the tension I feel when I have not smoked for a while	.70
to satisfy my addiction to nicotine	.72
to satisfy a craving for a cigarette	.77
to reduce the physical discomfort I feel when I have not smoked for a while	.81
mean inter-item correlation	**.51**
standardized item alpha	**.81**
alpha coefficient	**.80**

8. EXPLORATORY ANALYSIS

Several studies in the area of smoking motivation and coping have demonstrated that females tend to score higher than males on measures of emotional regulation. More specifically, a number of studies employing the *Reasons for Smoking Scale* have shown that females score significantly higher than males on the *Reduction in Negative Affect* subscale (Ikard, Green & Horn, 1969; Livision & Leino, 1988). Similar findings have been observed in the coping literature with females consistently reporting greater use of emotion-focussed coping strategies than their male counterparts (Forrester, 1997; Endler & Parker, 1994; Folkman & Lazarus, 1980). As part of establishing the construct validity of the two factor *Smoking Motives Inventory*, a two group multivariate analysis of variance (MANOVA) was conducted to test whether males and females differed in their scores on the two subscales. Based on the findings described above, it was hypothesized that females would score significantly higher than males on the *Reduction in Negative Affect* subscale of the SMI. No significant gender differences were expected on the *Addiction* subscale.

8.1 SMI Subscales by Gender

A two group MANOVA was performed to test whether females scored significantly higher than males on the *Reduction in Negative Affect* subscale and to explore the relationship between gender and the *Addiction* subscale. Of the 200 cases available for analysis, five were rejected because of missing data. Tests of homogeneity of variance showed that the assumption was satisfied for the two dependent variables. The assumption of homogeneity of variance-covariance matrices was tested using Box's M test. The assumption was satisfied ($F(3,349909) = .56$, $p = .641$). Examination of the standardized

residuals revealed no outliers (ie., z scores greater than +/- 3.0). The dependent variables were found to be significantly correlated, as tested by Bartlett's test of Sphericity (51.87, p = 0.000). However, there was no problem of multicollinearity in the data.

Employing harmonic means for unequal cell sizes, Wilks' criterion for combined dependent variables showed no effect for gender F (2,192) = 2.25, p = .108. Univariate analyses also did not show an effect for gender, although the effect on *Reduction in Negative Affect* did approach statistical significance (F (1,193) = 3.32, p = .070) with females having higher mean scores than their male counterparts (24.86 and 22.73, respectively).

9. DISCUSSION

The principal aim in conducting this study was to develop a clinically relevant and psychometrically sound scale to measure smoking motivation. Consistent with our aim, this discussion will focus first on examining the smoking motive factors determined to be important by our sample of regular daily smokers and how this relates to the constructs described in the literature. Second, we evaluate how the resultant *Smoking Motives Inventory* performs from a psychometric standpoint. Finally, the chapter closes with suggested directions for future research and a discussion of the limitations of the study.

9.1 The Importance of Smoking Motives

Based on the data gathered from our sample, the present study has revealed that there are three important factors that motivate regular daily smokers to maintain their smoking behaviour. Specifically, our data demonstrate that regular daily smokers are motivated to maintain their smoking behaviour to reduce or eliminate negative emotions, to satisfy their addiction to cigarettes and to obtain pleasure and relaxation. What does this mean when evaluated in the context of that described in literature? Our own comprehensive review of the literature concluded that there were at least seven factors that motivate regular smokers to maintain their smoking behaviour -- not three.

One possible explanation for our finding of fewer important smoking motive factors is that our sample of regular daily smokers is somehow less "*differentiated*" in terms of their motives for smoking than those samples utilized in previous studies. It will be recalled that theoretical models of drug outcome expectancies postulate that expectancies, in this case smoking outcome expectancies, become more specific and differentiated with experience.

If our sample was comprised of less experienced smokers this would be a plausible explanation – however, our data do not uphold this interpretation. Estimating the number of years of smoking experience by subtracting the mean age for smoking initiation from the mean age of respondents at the time of questionnaire completion indicates that our sample has on average 25 years of smoking experience. With an average of 25 years of experience, one would expect that our sample of smokers would be characterized by an equally differentiated and sophisticated repertoire of smoking motives.

It is our premise that the more likely explanation for our finding of fewer smoking motive factors rests with differences in scale construction methodology and in particular, an over reliance on psychometric strategies, such as factor analysis, in other studies. Comparing our methodology with that employed in the construction of the other measurement tools, we note that ours is the only study to use a balance of rational and empirical approaches to scale development. This means that from the generation of items through to decisions made concerning the number of items to retain in the final measure, we used a balance of statistical and intuitively meaningful criteria to guide the development of our scale.

For instance, other than our own, not one of the scale development studies examined incorporated item validation as a component of the steps involved in the generation of an item pool. For the most part, items for these studies were generated by the researchers themselves, sometimes with the assistance of graduate students, to reflect a specific theoretical formulation of smoking motivation. Our study, on the other hand, went a step further. After generating a list of items to reflect the seven smoking motive constructs identified in our literature review, items were validated by regular daily smokers as well as

experts in the field of addiction and/or motivation to ensure both that items were relevant to smokers and that they corresponded satisfactorily with our operational definition of smoking motivation. In addition, to further validate the items and their respective constructs we performed a principal components analysis on the item pool. The resulting factors closely resembled the smoking motive constructs identified as relevant in the literature, thus validating the initial stage of scale development. Although the shortcomings noted of the other studies are important as they impact on the subsequent practical utility of the scales, they probably do not explain the observed discrepancy in the number of important smoking motive factors. This discrepancy is more likely accounted for by differences in the use and interpretation of factor analytic procedures.

Factor analytic procedures are powerful tools for researchers involved in scale development. They are especially useful in determining how many factors, or hypothetical latent constructs underlie a given set of items (DeVellis, 1991). Specifically, factor analysis is a mathematical procedure aimed at identifying factors that mathematically account for patterns of covariation among items (DeVellis, 1991). Unfortunately, given its complexity there are many opportunities for misinterpretation associated with the use of factor analytic strategies (Shiffman, 1993). One common error of interpretation, as observed in the majority of smoking typology validation studies, is the incorrect inference that a stable factor structure confirms and validates the importance of the observed factors (Shiffman, 1993). A stable factor structure only indicates that respondents agree about how items are correlated with one another (Shiffman, 1993). It does not imply that they agree about the importance and relevance of the items.

Another common source of misinterpretation in the use of factor analytic procedures in scale construction involves how decisions are made concerning the number of factors to retain in a factor solution. Inasmuch as factor solutions are really mathematical solutions they are not necessarily practically meaningful. Over-reliance on statistical criteria in the determination of the number of factors to retain in a given factor solution can lead to either an overestimation or underestimation of the number of important and meaningful factors retained.

A review of the factor analytic methodology adopted in the other scale development studies revealed that ours was the only investigation that incorporated both statistical and clinical judgement criteria to determine: (1) which items would be eligible for inclusion in the factor analysis and (2) which of these candidate items would be retained in the resulting factor solution. By imposing these criteria we ended up with a three-factor solution as opposed to a seven factor solution. However, it should be pointed out that, had we entered all of the items in the item pool and used the same criterion as that employed in the other studies (ie., inclusion of factors with eigenvalues greater than unity) we would have similarly found support for the seven smoking motive factors identified in the literature.

Having identified the most likely reason for the discrepant results, what does it mean that we ended up with three smoking motive factors when our review of the literature identified at least seven factors that motivate regular smokers to maintain their smoking behaviour? It is our conviction that our results are not as divergent from those reported in the literature as they might first appear. It will be recalled that despite differences in theoretical orientation, a common theme emerged from our review of the literature.

Specifically, it was noted that the literature consistently demonstrated that regular smokers maintain their smoking behaviour in an unremitting cyclical effort to obtain the perceived benefits of smoking and to avoid the negative consequences of not smoking. Our finding of three important smoking motive factors, *Reduction in Negative Affect*, *Addiction* and *Pleasure and Relaxation* are consistent with this interpretation. The cycle is illustrated as follows: When a smoker is abstinent for a while he or she begins to feel internal tension associated with withdrawal from nicotine (negative consequence of abstinence). As the physiologic tension increases, the smoker becomes increasingly irritable and experiences negative emotions (negative consequence of abstinence). When the smoker finally smokes a cigarette, the intake of nicotine reverses both the physiological and emotional consequences associated with withdrawal and the smoker relaxes and feels a sense of pleasure (positive consequence of smoking).

9.2 Psychometric Properties of the SMI

The validity and reliability of a newly developed measure cannot be fully established in any one study. Data need to be collected and evaluated on numerous samples and across a variety of situations to fully establish the psychometric properties of an instrument. This process usually takes several years or more. As a result, the present discussion of the psychometric properties of the SMI is necessarily limited to a preliminary analysis. It will be recalled that the analysis excluded an assessment of the psychometric properties of the *Pleasure and Relaxation* subscale for it requires further development and exploration.

Despite being very preliminary, our analysis of the psychometric properties of the *Reduction in Negative Affect* and *Addiction* subscales of the SMI lend support to the validity

and reliability of the measure. An examination of the construct validity of the *Reduction in Negative Affect* and *Addiction* subscales showed significant moderately strong correlations in the predicted directions with variables of interest. These findings are not surprising given that several steps were incorporated into the construction of the scale to ensure a certain degree of both content and construct validity. As previously mentioned, regular daily smokers and experts in the field of addiction and/or motivation were invclved in the generation of items. Where interviewed smokers validated the content of the scale by ensuring the relevance of its items, the ratings provided by experts in the field ensured that items corresponded sufficiently with the operational definition of smoking motivation.

In terms of reliability, our analysis was restricted to an examination of the internal consistency reliability of the SMI. As respondents completed the scale on only the one occasion, it was not possible to calculate test-retest reliabilities. In addition, our sample was not sufficiently large enough to permit the alternate calculation of split-half reliabilities. Notwithstanding the noted limitations, our analysis provides very strong support for the internal consistency reliability of the SMI subscales. Alpha coefficients indicated a high degree of internal consistency for both the *Reduction in Negative Affect* and *Addiction* subscales meaning that the items which make up these subscales are highly interrelated and that they measure the construct they are intended to measure. Further to this, item-remainder and mean inter-item correlations provided strong support for the internal stability of the subscales.

9.3 Conclusion

The main finding of the present research study is that there are three prominent and

important factors which motivate established smokers to maintain their smoking behaviour. Specifically, our data demonstrate that regular daily smokers are motivated to maintain their smoking behaviour to reduce or eliminate negative emotions, to satisfy their addiction to cigarettes and to obtain pleasure and relaxation. Although previous research has identified at least seven motivating factors, ours is the only study which examined the relative importance of these factors to the maintenance of smoking behaviour. Furthermore, we demonstrated that our three-factor model of smoking motivation is entirely consistent with the underlying theme identified in the literature review, that is, that regular daily smokers maintain their smoking behaviour in an effort to maintain a homeostatic balance between the perceived benefits of smoking and the negative consequences of abstinence. Though limited, preliminary examination of the psychometric properties of two of the SMI subscales provided initial support for the validity and reliability of the measure.

Despite its strengths in terms of study design and methodology, the present study is not without its limitations. For instance, there are potential limits on the generalizability of the study as the sample was small and over two-thirds of respondents were female. It is possible that males and females may differ in terms of the factors which motivate them to maintain their smoking behaviour. Unfortunately, the sample size did not permit analyses to be conducted separately by gender to ensure that the three-factor solution was equally appropriate for both males and females. An examination of between group differences on the *Reduction in Negative Affect* and *Addiction* factors, however, indicated that males and females did not differ significantly in their mean scores for the two subscales suggesting that they are equally important to both males and females.

An additional limitation of the study concerns the examination of the construct validity of the SMI. As the evaluation of construct validity involves the testing of hypotheses specifying defined relationships between smoking motives and other variables, it was not possible to formulate such hypotheses until such time as the inventory was developed. As a result the measures we used to assess the construct validity of the subscales, in particular the *Reduction in Negative Affect* subscale were not necessarily the most appropriate. Further validation studies on established smokers are required.

In terms of directions for future research we suggest that, first and foremost, further work is required to develop and explore the *Pleasure and Relaxation* smoking motive factor. In addition, more research needs to be conducted to establish the psychometric properties and practical utility of the *Smoking Motives Inventory*. With regard to the former, research aimed at establishing the validity of the subscales is especially important. For example, a self-monitoring study to establish the criterion validity of the scale may be conducted where support for the scale's validity would be observed in the strong correspondence between scores on the subscales and motives for smoking in the natural environment. With regard to establishing the practical utility of the scale, we suggest that research needs to be conducted to examine the relationship between subscale scores on the SMI and subsequent relapse in abstinent smokers. Epidemiological studies have indicated that negative affect interferes with smoking cessation (Anda, Williamson, Escobedo et al., 1990). The practical utility of the SMI would be demonstrated to the extent that scores on its subscales were predictive of relapse among smokers attempting to quit smoking. Similar studies could be carried out to examine the relationship between the SMI subscales and readiness to quit smoking as well

as perceived difficulty in quitting.

Further work will also be required to examine how the three subscales perform with less experienced smokers. The present study focussed on the factors which motivate regular daily smokers to maintain their smoking behaviour. It is possible that the factors which motivate less experienced smokers to continue to smoke may different. Understanding the factors which motivate smokers with varying histories to maintain their smoking behaviour is important.

Motivational smoking cessation interventions focus on shifting smokers' perceptions about the benefits of smoking versus the benefits of quitting (Winders, Kohler, Grimley et al., 1999). The smoker becomes motivated to quit smoking when the perceived benefits of quitting begin to outweigh those of continuing to smoke. With guidance through motivational interviewing, smokers interested in cessation can shift their own perceptions and begin to value the reasons for quitting more than the reasons for continuing (Miller & Rollnick, 1991). The Smoking Motives Inventory may be useful in assisting health care providers as well as their clients to understand the specific motives and their relative importance in the maintenance of smoking behaviour. This information can then be used to apply more client-specific interventions aimed at shifting the decisional balance of smokers from continuing to smoke to smoking cessation. Multicomponent tobacco-use cessation interventions often incorporate telephone or other forms of support to assist their clients during times of difficulty. To be effective in reducing relapse, the support provided to clients needs to be effective in maintaining high levels of motivation to remain smoke-free. The Smoking Motives Inventory can assist by determining the specific smoking motive factors

which are operating to maintain the smoking behaviour so that more effective supports can be developed to counteract this influence.

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APPENDIX A

Expert Evaluation: Construct Validity

Smoking Motivation Study

Expert Evaluation: Construct Validity

A review of the literature combined with several key informant interviews has revealed that there are a least eight factors or motives that contribute to the maintenance of smoking among regular daily smokers. For each of these motives we have generated a list of items. In total we have come up with a list of 63 items which measure the reasons why regular daily smokers continue to smoke. You will notice that some of the items measure the same motive for smoking but are worded a little bit differently. This list is too long.

We need your expert advice to help us make this list shorter. We are interested in keeping those items which best correspond to the theoretical construct of smoking motivation. We have operationally defined smoking as:

> *"A goal directed behaviour. Regular smokers maintain their smoking behaviour to experience the benefits associated with smoking, whether it be the enhancement or maintenance of the positive consequences of smoking or the reduction or elimination of the negative consequences of not smoking."*

For each factor we are asking that you score the items according to how well they correspond to the general operational definition of smoking and to the specific smoking motive in particular. Additional space following each motive has been provided to record your comments and/or suggestions. Your ratings and comments, in combination with that of three of your peers will be used to guide the development of our questionnaire on smoking motives.

Thank you for helping us with our study. Your time and effort are greatly appreciated.

Physical Addiction

In physical addiction, the motive underlying smoking behaviour is to reduce or eliminate the negative consequences or symptoms associated with a physical addiction to cigarettes.

Using the scale below, please rate the following items according to how well they correspond to the above definition.

1 (does not correspond at all) .....5 (corresponds very well)

Sometimes I smoke to ...

❑...satisfy an overpowering urge for a cigarette.

❑...satisfy a need for nicotine.

❑...reduce the physical discomfort I feel when I have been without a cigarette for too long.

❑...satisfy my addiction to cigarettes.

❑...satisfy a craving for a cigarette.

❑...feel better physically.

Comments and Suggestions:

Positive Affect: Relaxation and Enjoyment

In relaxation and enjoyment, the motive underlying smoking behaviour is to enhance or maintain feelings of relaxation and/or enjoyment.

Using the scale below, please rate the following items according to how well they correspond to the above definition.

1 (does not correspond at all) .....5 (corresponds very well)

Sometimes I smoke to try to ...

❑...relax.

❑...feel happier.

❑...reward myself for completing a task.

❑...increase feelings of well-being.

❑...feel a sense of enjoyment.

❑...feel the satisfaction a cigarette gives me after a meal.

❑...wind down at the end of the day.

Comments and Suggestions:

Reduction in Negative Affect

In the reduction of negative affect, the motive underlying smoking behaviour is to reduce or eliminate negative emotions or feelings.

Using the scale below, please rate the following items according to how well they correspond to the above definition.

1 (does not correspond at all) .....5 (corresponds very well)

Sometimes I smoke to try to ...

❑...reduce the irritability I feel when I have not smoked for a while.

❑...reduce distressing feelings.

❑...calm myself down when I am feeling angry.

❑...reduce feelings of anxiety.

❑...cope with stress.

❑...feel better when I am upset.

❑...cope when I am worried about something.

❑...calm my nerves when I am feeling anxious.

❑...cope when I am feeling nervous.

❑...feel more relaxed around other people.

❑...cope when I am feeling depressed.

❑...cope with feeling sad.

❑...cope with feeling embarrassed.

❑...cope with feelings of shame.

❑...distract myself when I am feeling nervous.

Comments and Suggestions:

Positive Affect: Sensory and Sensory-Motor Gratification

In sensory and sensory-motor gratification, the motive underlying smoking behaviour is to experience the sensory gratification associated with smoking.

Using the scale below, please rate the following items according to how well they correspond to the above definition.

1 (does not correspond at all) .....5 (corresponds very well)

Sometimes I smoke to ...

❑...enjoy the taste of cigarettes.

❑...get the satisfaction of watching the smoke rise.

❑...get the satisfaction of making smoke rings.

❑...get the satisfaction of handling a cigarette.

❑...get the satisfaction of moving the ashes around in the ashtray with my cigarette.

❑...get the satisfaction of having something to do with my hands.

❑...feel the satisfaction of lighting a cigarette.

Comments and Suggestions:

Positive Affect: Stimulant Smoking

In stimulant smoking, the motive underlying smoking behaviour is to enhance or maintain a state of arousal or concentration.

Using the scale below, please rate the following items according to how well they correspond to the above definition.

1 (does not correspond at all) .....5 (corresponds very well)

Sometimes I smoke to help myself ...

❑...concentrate.

❑...think more clearly.

❑...relieve feelings of boredom.

❑...keep myself from slowing down when I am tired.

❑...focus my attention.

❑...get energy when I need a boost.

Comments and Suggestions:

Social / Social Confidence

In social / social confidence smoking, the motive underlying smoking behaviour is to reduce or eliminate feelings of discomfort associated with social situations.

Using the scale below, please rate the following items according to how well they correspond to the above definition.

1 (does not correspond at all) .....5 (corresponds very well)

Sometimes I smoke to try to ...

❑...fit in at social gatherings.

❑...feel accepted by other people who smoke.

❑...avoid feeling left out by my friends who smoke.

❑...feel closer to members of my family that smoke.

❑...feel less alone in a crowd.

❑...feel more self-confident around other people.

Comments and Suggestions:

Weight / Appetite Control

In weight / appetite control, the motive underlying smoking behaviour is to reduce or maintain one's weight and/or control one's appetite.

Using the scale below, please rate the following items according to how well they correspond to the above definition.

1 (does not correspond at all) .....5 (corresponds very well)

Sometimes I smoke to help myself ...

❑...avoid gaining weight.

❑...avoid eating junk food.

❑...avoid gaining more weight.

❑...feel less hungry.

❑...lose weight.

❑...keep slim.

❑...reduce the urge to snack.

Comments and Suggestions:

Smoking Identity

In smoking identity, the motive underlying smoking behaviour is to maintain one's sense of identity or self.

Using the scale below, please rate the following items according to how well they correspond to the above definition.

1 (does not correspond at all) .....5 (corresponds very well)

Sometimes I smoke ...

❑...because I think of myself as a smoker.

❑...because smoking is consistent with my image of myself.

❑...because other people know me as a smoker.

❑...to keep my identity as a smoker.

❑...because I cannot see myself not smoking.

❑...because it is a part of who I am.

❑...because I would not feel like myself unless I smoked.

❑...because other people expect that I will smoke.

❑...because I just see myself as a smoker.

Comments and Suggestions:

APPENDIX B

Expert Item Ratings: Construct Validity

Expert Evaluation: Construct Validity

Items **Sometimes I smoke to...**	**Rater 1 score**	**Rater 2 score**	**Rater 3 score**	**Rater 4 score**	**Overall Mean**	**Mean Best 3 of 4 Scores**
Physical Addiction						
satisfy an overpowering urge for a cigarette	4	3	3	3	3.25	3.33
satisfy a need for nicotine	4	1	3	3	2.75	3.33
reduce the physical discomfort I feel when I have been without a cigarette for too long	5	5	4	5	4.75	5.0
satisfy my addiction to cigarettes	1	1	2	----	1.3	1.3
satisfy a craving for a cigarette	5	3	5	3	4.0	4.33
feel better physically	3	1	4	4	3.0	3.67
Relaxation & Enjoyment						
relax	5	5	5	5	5.0	5.0
feel happier	2	2	3	4	2.75	3.0
reward myself for completing a task	3	3	5	4	3.75	4.0
increase feelings of well-being	5	4	4	3	4.0	4.33
feel a sense of enjoyment	2	4	3	5	3.5	4.0
feel the satisfaction a cigarette gives me after a meal	5	5	5	4	4.75	5.0

Items Sometimes I smoke to...	Rater 1 score	Rater 2 score	Rater 3 score	Rater 4 score	Overall Mean	Mean Best 3 of 4 Scores
wind down at the end of the day	4	4	5	5	4.5	4.67
Reduction in Negative Affect						
reduce the irritability I feel when I have not smoked for a while	5	3	3	5	4.0	4.33
reduce distressing feelings	1	5	3	5	3.5	4.33
calm myself down when I am feeling angry	5	4	5	5	4.75	5.0
reduce feelings of anxiety	5	5	2	5	4.25	5.0
cope with stress	5	2	5	3	3.75	4.33
feel better when I am upset	5	2	5	3	3.75	4.33
cope when I am worried about something	4	2	4	4	3.5	4.0
calm my nerves when I am feeling anxious	5	5	5	5	5.0	5.0
cope when I am feeling nervous	5	2	3	4	3.5	4.0
feel more relaxed around other people	----	4	4	3	2.75	3.67
cope when I am feeling depressed	5	2	2	4	3.25	3.67
cope with feeling sad	5	2	4	4	3.75	4.33
cope with feeling embarrassed	4	2	2	4	3.0	3.33
cope with feelings of shame	1	2	2	3	2.0	2.33

Items Sometimes I smoke to...	Rater 1 score	Rater 2 score	Rater 3 score	Rater 4 score	Overall Mean	Mean Best 3 of 4 Scores
distract myself when I am feeling nervous	1	5	2	5	3.25	4.0
Sensory & Sensory Motor Gratification						
enjoy the taste of cigarettes	5	5	5	5	5.0	5.0
get the satisfaction of watching the smoke rise	4	5	2	3	3.5	4.0
get the satisfaction of making smoke rings	1	2	3	3	2.25	3.0
get the satisfaction of handling a cigarette	5	4	4	4	4.25	4.33
get the satisfaction of moving the ashes around in the ashtray with my cigarette	4	4	2	3	3.25	3.67
get the satisfaction of having something to do with my hands	5	3	5	5	4.5	5.0
feel the satisfaction of lighting a cigarette	5	3	2	5	3.75	4.33
Stimulant Smoking						
concentrate	5	1	4	5	3.75	4.67
think more clearly	5	1	5	5	4.0	5.0
relieve feelings of boredom	4	5	5	5	4.75	5.0
keep myself from slowing down when I am tired	4	1	3	4	3.0	3.67
focus my attention	3	1	4	5	3.25	4.0

Items Sometimes I smoke to...	Rater 1 score	Rater 2 score	Rater 3 score	Rater 4 score	Overall Mean	Mean Best 3 of 4 Scores
get energy when I need a boost	5	4	3	5	4.25	
Social/Social Confidence						
fit in a social gatherings	5	2	2	3	3.0	3.33
feel accepted by other people who smoke	5	1	5	5	4.0	5.0
avoid feeling left out by my friends who smoke	4	5	5	5	4.75	5.0
feel closer to members of my family that smoke	4	1	3	4	3.0	3.67
feel less alone in a crowd	3	1	4	5	3.25	4.0
feel more self-confident around other people	5	4	3	5	4.25	4.67
Weight/Appetite Control						
avoid gaining weight	5	5	5	5	5.0	5.0
avoid eating junk food	5	5	2	3	3.75	4.33
avoid gaining more weight	1	5	5	5	4.0	5.0
feel less hungry	5	5	2	5	4.25	5.0
lose weight	4	2	2	3	2.75	3.0
keep slim	4	3	3	5	3.75	4.0
reduce the urge to snack	3	5	5	4	4.25	4.67

Items Sometimes I smoke to...	Rater 1 score	Rater 2 score	Rater 3 score	Rater 4 score	Overall Mean	Mean Best 3 of 4 Scores
Smoking Identity						
because I think of myself as a smoker	4	5	3	3	3.75	4.0
because smoking is consistent with my image of myself	3	5	5	3	4.0	4.33
because other people know me as a smoker	1	4	5	4	3.5	4.33
to keep my identity as a smoker	3	3	2	4	3.0	3.33
because I cannot see myself not smoking	3	4	2	4	3.25	3.67
because it is a part of who I am	5	5	5	5	5.0	5.0
because I would not feel like myself unless I smoked	4	5	2	5	4.0	4.67
because other people expect that I will smoke	1	4	2	3	2.5	3.0
because I just see myself as a smoker	4	5	4	3	4.0	4.33

APPENDIX C

Sample Characteristics

Sample Characteristics (N = 200)	
Gender	
Male (number)	65
Female (number)	134
Age	
Mean age (years)	41.6
Education (highest level completed)	
Primary School	18
High School	62
Post Secondary	118
Mean education (years)	14.3
Age Started Smoking	
Mean age of onset (years)	16.0
Quit Attempts	
Mean number of quit attempts	3.8
Smoking Cessation Aids Used	
Nicotine Patch	55
Nicotine Gum	54
Zyban (Antidepressant)	42
Formal Smoking Cessation Program	
Number who tried formal program	41

APPENDIX D

Information/Consent Form

PARTICIPANT INFORMATION AND CONSENT FORM

This research project is looking at smoking among regular daily smokers. We are especially interested in learning about the reasons people have for smoking. Many people believe that the main reason why regular smokers continue to smoke is because they are addicted to nicotine, however, the causes of smoking are more complicated and people smoke for many different reasons.

Our main goal in doing this research is to develop a questionnaire on smoking motives. We believe that a questionnaire of this kind will help increase our understanding of the reasons why regular smokers continue to smoke and help us design more effective cessation programs. As someone who smokes your ideas are important to us. The information that you provide will be used to guide the development of our questionnaire. Your participation in the study is voluntary and you may decide not to participate or to withdraw at any time without any consequence. In addition, all of the information you give us will be completely confidential and anonymous.

As a participant in our project you will be asked to complete a questionnaire. The questionnaire takes about 15 minutes to complete and involves answering a number of questions about how you see your smoking. At the end of the questionnaire you will be provided with additional space to write your comments and/or concerns. A pre-paid business reply envelope has been provided for returning the completed questionnaire to us.

You will not be asked to put your name, address or telephone number on the questionnaire. The questionnaires will be identified only by a number. To further protect your anonymity and the confidentiality of the information that you provide, only members of the research team will have access to the questionnaires which will be kept in a secure environment. After the project is finished, all of the records will be destroyed. Finally, when we publish our results or present them at scientific meetings, the information provided by all participants will be shown in aggregate form so that no individual participant could ever be identified.

As a participant in our project you may, at any time:

- choose not to answer any question; and
- withdraw completely from the study with no consequence.

If you have any questions or would like more information on the study, please feel free to contact the principal investigator. Her name is:

Leslie Forrester
Telephone (613) 957-3041
e-mail at Leslie_Forrester@hc-sc.gc.ca

The study is being supervised by Dr. Stephen Hotz from the Department of Epidemiology and Community Medicine at the University of Ottawa. If you have any questions about the study, you may contact him at **(613) 233-1630**.

If you have any questions about the health hazards associated with smoking, or would like more information about the different treatments available to stop smoking please contact your health care provider. You may also choose to call or visit the Health Unit or Department in your community.

If you agree to participate kindly complete and return the questionnaire.
If you do not wish to participate please pass the questionnaire on to another smoker.

Thank You

APPENDIX D

Smoking Motivation Questionnaire

Smoking Motivation Questionnaire

PARTICIPANT INFORMATION

1. What are the first three digits of your postal code? _____

2. Are you male or female ❑ Male ❑ Female

3. How old are you? _____ (age in years)

4. For **each** of the following levels of education **circle** the number of years or highest grade you completed.

Primary school	1 2 3 4 5 6 7 8
High school	9 10 11 12 13
College/Technical school	1 2 3 4
University	1 2 3 4 5 6 7 8 9 10

SMOKING STATUS

PART A

5. At what age did you start smoking? _____ (age in years)

6. On average, how many cigarettes a day do you smoke? _____

7. Have you ever tried to quit smoking? ❑ Yes ❑ No

IF YES,

8. a. About how many times? _____ (number of times)

   b. What is the longest period of time that you quit? Complete **each** of the following time categories so that when added together the total equals the longest period of time that you quit. Mark those options that do not apply with a zero (0)

   Hours_____ Days_____ Weeks_____ Months____ Years ____

9. Have you ever asked your doctor or pharmacist for information on medication to help you quit smoking? ❑ Yes ❑ No

IF YES,

10. Have you tried any of the following products?

1.	Nicotine patch	❑ Yes	❑ No
2.	Nicotine gum	❑ Yes	❑ No
3.	Zyban	❑ Yes	❑ No

11. Have you ever participated in a formal smoking cessation program?

❑ Yes ❑ No

PART B

12. Are there other people in your household that smoke?

❑ Yes ❑ No ❑ I live alone

13. Does your significant other (husband, wife, partner) smoke?

❑ Yes ❑ No ❑ Currently Single

14. Do most of your close friends smoke? ❑ Yes ❑ No

PART C

15. Do you smoke more during the morning than during the rest of the day?

❑ Yes ❑ No

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

❑ Within 30 minutes ❑ After more than 30 minutes

17. Which cigarette would you hate to give up? (***check only one***)

    1. The first cigarette in the morning ❑
    2. The cigarette after a meal ❑
    3. The last cigarette before retiring for the night ❑

18. Do you find it difficult to refrain from smoking in places where it is forbidden?

    ❑ Yes ❑ No

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

    ❑ Yes ❑ No

PART D

20. Do you intend to quit smoking within the next 6 months? ❑ Yes ❑ No

21. Do you intend to quit within 1 month? ❑ Yes ❑ No

22. If yes, have you tried to quit for at least 24 hours in the past year? ❑ Yes ❑ No

PART E

23. How confident are you that you could **function under stress** without smoking?

    1 2 3 4 5 6 7

    1 = not at all confident *7 = very confident*

24. How have restrictions on smoking changed your smoking behaviour?

a. I now smoke less often in public.

❑ Yes ❑ No

b. I now smoke less often at home.

❑ Yes ❑ No

c. I now smoke more often in public.

❑ Yes ❑ No

d. I now smoke more often at home.

❑ Yes ❑ No

e. I have not changed my smoking behaviour.

❑ Yes ❑ No

25. How comfortable do you feel smoking around people who do not smoke?

1 2 3 4 5 6 7

1 = very uncomfortable *7 = very comfortable*

SMOKING MOTIVES INVENTORY

The statements below describe some different reasons for smoking. Please **circle** a number from **1 (not at all important)** to **7 (extremely important)** that best describes how important each reason is to you. Remember, there are no right or wrong answers. Just **circle** the number that best reflects how you feel.

Sometimes I smoke ...

1 = Not at all Important ... 7 = Extremely Important		1	2	3	4	5	6	7
26.	to reduce the physical discomfort I feel when I have not smoked for a while.	1	2	3	4	5	6	7
27.	to calm myself down when I am feeling angry.	1	2	3	4	5	6	7
28.	to relax.	1	2	3	4	5	6	7
29.	to enjoy the taste of cigarettes.	1	2	3	4	5	6	7
30.	to concentrate.	1	2	3	4	5	6	7
31.	to feel accepted by other people who smoke.	1	2	3	4	5	6	7
32.	to avoid gaining weight.	1	2	3	4	5	6	7
33.	because smoking is consistent with my image of myself.	1	2	3	4	5	6	7
34.	to satisfy a craving for a cigarette.	1	2	3	4	5	6	7
35.	to reduce feelings of anxiety.	1	2	3	4	5	6	7
36.	to increase feelings of well-being.	1	2	3	4	5	6	7
37.	to get the satisfaction of watching the smoke rise.	1	2	3	4	5	6	7
38.	to think more clearly.	1	2	3	4	5	6	7
39.	to avoid feeling left out by my friends who smoke.	1	2	3	4	5	6	7
40.	to avoid gaining more weight.	1	2	3	4	5	6	7
41.	because other people know me as a smoker.	1	2	3	4	5	6	7
42.	to reduce the tension I feel when I have not smoked for a while.	1	2	3	4	5	6	7
43.	to cope with stress.	1	2	3	4	5	6	7
44.	to feel a sense of pleasure.	1	2	3	4	5	6	7
45.	to get the satisfaction of handling a cigarette.	1	2	3	4	5	6	7

Please **circle** a number from **1 (not at all important)** to **7 (extremely important)** that best describes how important each reason is to you.

Sometimes I smoke ...

1 = Not at all important ... 7 = Extremely important		1	2	3	4	5	6	7
46.	to relieve feelings of boredom.	1	2	3	4	5	6	7
47.	to feel less alone in a crowd.	1	2	3	4	5	6	7
48.	to feel less hungry.	1	2	3	4	5	6	7
49.	because it is a part of who I am.	1	2	3	4	5	6	7
50.	to satisfy my addiction to nicotine	1	2	3	4	5	6	7
51.	to feel better when I am upset.	1	2	3	4	5	6	7
52.	to feel the satisfaction a cigarette gives me.	1	2	3	4	5	6	7
53.	to get the satisfaction of having something to do with my hands.	1	2	3	4	5	6	7
54.	to focus my attention.	1	2	3	4	5	6	7
55.	to feel more self-confident around other people.	1	2	3	4	5	6	7
56.	to reduce the urge to snack.	1	2	3	4	5	6	7
57.	because I would not feel like myself unless I smoked.	1	2	3	4	5	6	7
58.	to reduce the irritability I feel when I have not had a cigarette in a while.	1	2	3	4	5	6	7
59.	to calm my nerves when I am feeling anxious	1	2	3	4	5	6	7
60.	to wind down.	1	2	3	4	5	6	7
61.	to feel the satisfaction of lighting a cigarette.	1	2	3	4	5	6	7
62.	to get energy when I need a boost.	1	2	3	4	5	6	7
63.	to feel more relaxed around other people.	1	2	3	4	5	6	7
64.	to keep slim.	1	2	3	4	5	6	7
65.	because I see myself as a smoker.	1	2	3	4	5	6	7

Thank you for taking the time to complete our questionnaire

Please return the questionnaire in the stamped envelope that has been provided

APPENDIX F

Descriptive Statistics: SMI Items

Descriptive Statistics: SMI Items

SMI 1	*To reduce the physical discomfort I feel when I have not smoked for a while*			
	Mean	4.2	S.E. Mean	.14
	Std Dev	1.9	Variance	3.6
	Kurtosis	-.91	S.E. Kurtosis	.35
	Skewness	.18	S.E. Skew	.17
SMI 2	*To calm myself down when I am feeling angry*			
	Mean	4.9	S.E. Mean	.14
	Std Dev	1.9	Variance	3.6
	Kurtosis	-.55	S.E. Kurtosis	.35
	Skewness	-.77	S.E. Skew	.17
SMI 3	*To relax*			
	Mean	4.9	S.E. Mean	.11
	Std Dev	1.7	Variance	2.8
	Kurtosis	-.25	S.E. Kurtosis	.35
	Skewness	-.65	S.E. Skew	.17
SMI 4	*To enjoy the taste of cigarettes*			
	Mean	3.6	S.E. Mean	.13
	Std Dev	1.8	Variance	3.4
	Kurtosis	-1.0	S.E. Kurtosis	.35
	Skewness	.17	S.E. Skew	.17
SMI 5	*To concentrate*			
	Mean	3.0	S.E. Mean	.13
	Std Dev	1.8	Variance	3.3
	Kurtosis	-.80	S.E. Kurtosis	.35
	Skewness	.48	S.E. Skew	.17

SMI 6 *To feel accepted by other people who smoke*

Mean	1.4	S.E. Mean	.08
Std Dev	1.2	Variance	1.1
Kurtosis	13.6	S.E. Kurtosis	.35
Skewness	3.6	S.E. Skew	.17

SMI 7 *To avoid gaining weight*

Mean	3.1	S.E. Mean	.16
Std Dev	2.3	Variance	5.3
Kurtosis	-1.3	S.E. Kurtosis	.35
Skewness	.53	S.E. Skew	.17

SMI 8 *Because smoking is consistent with my image of myself*

Mean	1.7	S.E. Mean	.10
Std Dev	1.4	Variance	2.0
Kurtosis	4.3	S.E. Kurtosis	.35
Skewness	2.2	S.E. Skew	.17

SMI 9 *To satisfy a craving for a cigarette*

Mean	5.6	S.E. Mean	.10
Std Dev	1.5	Variance	2.1
Kurtosis	1.3	S.E. Kurtosis	.35
Skewness	-1.2	S.E. Skew	.17

SMI 10 *To reduce feelings of anxiety*

Mean	4.8	S.E. Mean	.13
Std Dev	1.8	Variance	3.1
Kurtosis	-.46	S.E. Kurtosis	.35
Skewness	-.64	S.E. Skew	.17

SMI 11 *To increase feelings of well-being*

Mean	2.8	S.E. Mean	.13
Std Dev	1.8	Variance	3.4
Kurtosis	-.42	S.E. Kurtosis	.35
Skewness	.76	S.E. Skew	.17

SMI 12 *To get the satisfaction of watching the smoke rise*

Mean	1.5	S.E. Mean	.08
Std Dev	1.2	Variance	1.4
Kurtosis	6.3	S.E. Kurtosis	.35
Skewness	2.6	S.E. Skew	.17

SMI 13 *To think more clearly*

Mean	2.5	S.E. Mean	.13
Std Dev	1.8	Variance	3.2
Kurtosis	-.46	S.E. Kurtosis	.35
Skewness	.87	S.E. Skew	.17

SMI 14 *To avoid feeling left out by my friends who smoke*

Mean	1.3	S.E. Mean	.07
Std Dev	1.0	Variance	1.1
Kurtosis	13.4	S.E. Kurtosis	.35
Skewness	3.6	S.E. Skew	.17

SMI 15 *To avoid gaining more weight*

Mean	3.0	S.E. Mean	.16
Std Dev	2.3	Variance	5.1
Kurtosis	-1.2	S.E. Kurtosis	.35
Skewness	.60	S.E. Skew	.17

SMI 16 *Because other people know me as a smoker*

Mean	1.5	S.E. Mean	.08
Std Dev	1.2	Variance	1.3
Kurtosis	8.0	S.E. Kurtosis	.35
Skewness	2.8	S.E. Skew	.17

SMI 17 *To reduce the tension I feel when I have not smoked for a while*

Mean	4.6	S.E. Mean	.14
Std Dev	1.9	Variance	3.7
Kurtosis	-.78	S.E. Kurtosis	.35
Skewness	-.48	S.E. Skew	.17

SMI 18 *To cope with stress*

Mean	4.8	S.E. Mean	.13
Std Dev	1.8	Variance	3.1
Kurtosis	-.37	S.E. Kurtosis	.35
Skewness	-.67	S.E. Skew	.17

SMI 19 *To feel a sense of pleasure*

Mean	4.0	S.E. Mean	.13
Std Dev	1.8	Variance	3.2
Kurtosis	-.91	S.E. Kurtosis	.35
Skewness	-.12	S.E. Skew	.17

SMI 20 *To get the satisfaction of handling a cigarette*

Mean	2.8	S.E. Mean	.13
Std Dev	1.8	Variance	3.1
Kurtosis	-1.0	S.E. Kurtosis	.35
Skewness	.53	S.E. Skew	.17

SMI 21 *To relieve feelings of boredom*

Mean	3.7	S.E. Mean	.14
Std Dev	1.9	Variance	3.8
Kurtosis	-1.2	S.E. Kurtosis	.35
Skewness	.03	S.E. Skew	.17

SMI 22 *To feel less alone in a crowd*

Mean	1.3	S.E. Mean	.11
Std Dev	1.5	Variance	2.2
Kurtosis	2.6	S.E. Kurtosis	.35
Skewness	1.9	S.E. Skew	.17

SMI 23 *To feel less hungry*

Mean	2.8	S.E. Mean	.13
Std Dev	1.9	Variance	3.5
Kurtosis	-.72	S.E. Kurtosis	.35
Skewness	.71	S.E. Skew	.17

SMI 24 *Because it is a part of who I am*

Mean	1.9	S.E. Mean	.10
Std Dev	1.5	Variance	2.1
Kurtosis	2.2	S.E. Kurtosis	.35
Skewness	1.7	S.E. Skew	.17

SMI 25 *To satisfy my addiction to nicotine*

Mean	5.0	S.E. Mean	.13
Std Dev	1.9	Variance	3.4
Kurtosis	-.36	S.E. Kurtosis	.35
Skewness	-.75	S.E. Skew	.17

SMI 26 *To feel better when I am upset*

Mean	4.7	S.E. Mean	.13
Std Dev	1.8	Variance	3.3
Kurtosis	-.55	S.E. Kurtosis	.35
Skewness	-.58	S.E. Skew	.17

SMI 27 *To feel the satisfaction a cigarette gives me*

Mean	4.2	S.E. Mean	.13
Std Dev	1.9	Variance	3.5
Kurtosis	-.92	S.E. Kurtosis	.35
Skewness	-.19	S.E. Skew	.17

SMI 28 *To get the satisfaction of having something to do with my hands*

Mean	3.1	S.E. Mean	.14
Std Dev	2.0	Variance	4.0
Kurtosis	-1.1	S.E. Kurtosis	.35
Skewness	.49	S.E. Skew	.17

SMI 29 *To focus my attention*

Mean	2.7	S.E. Mean	.13
Std Dev	1.8	Variance	3.3
Kurtosis	-.59	S.E. Kurtosis	.35
Skewness	.76	S.E. Skew	.17

SMI 30 *To feel more self-confident around other people*

Mean	1.7	S.E. Mean	.09
Std Dev	1.3	Variance	1.6
Kurtosis	5.2	S.E. Kurtosis	.35
Skewness	2.3	S.E. Skew	.17

SMI 31 *To reduce the urge to snack*

Mean	2.9	S.E. Mean	.15
Std Dev	2.0	Variance	4.1
Kurtosis	-.99	S.E. Kurtosis	.35
Skewness	.60	S.E. Skew	.17

SMI 32 *Because I would not feel like myself unless I smoked*

Mean	2.0	S.E. Mean	.11
Std Dev	1.6	Variance	2.5
Kurtosis	1.7	S.E. Kurtosis	.35
Skewness	1.7	S.E. Skew	.17

SMI 33 *To reduce the irritability I feel when I have not had a cigarette in a while*

Mean	4.6	S.E. Mean	.14
Std Dev	2.0	Variance	3.9
Kurtosis	-.90	S.E. Kurtosis	.35
Skewness	-.47	S.E. Skew	.17

SMI 34 *To calm my nerves when I am feeling anxious*

Mean	4.9	S.E. Mean	.12
Std Dev	1.7	Variance	3.0
Kurtosis	-.25	S.E. Kurtosis	.35
Skewness	-.68	S.E. Skew	.17

SMI 35 *To wind down*

Mean	4.6	S.E. Mean	.12
Std Dev	1.7	Variance	2.8
Kurtosis	-.42	S.E. Kurtosis	.35
Skewness	-.47	S.E. Skew	.17

SMI 36 *To feel the satisfaction of lighting a cigarette*

Mean	2.4	S.E. Mean	.12
Std Dev	1.7	Variance	2.9
Kurtosis	-.04	S.E. Kurtosis	.35
Skewness	1.0	S.E. Skew	.17

SMI 37 *To get energy when I need a boost*

Mean	2.4	S.E. Mean	.12
Std Dev	1.7	Variance	2.9
Kurtosis	.38	S.E. Kurtosis	.35
Skewness	1.2	S.E. Skew	.17

SMI 38 *To feel more relaxed around other people*

Mean	2.2	S.E. Mean	.12
Std Dev	1.6	Variance	2.7
Kurtosis	.95	S.E. Kurtosis	.35
Skewness	1.4	S.E. Skew	.17

SMI 39 *To keep slim*

Mean	2.6	S.E. Mean	.14
Std Dev	2.0	Variance	4.1
Kurtosis	-.43	S.E. Kurtosis	.35
Skewness	.98	S.E. Skew	.17

SMI 40 *Because I see myself as a smoker*

Mean	2.0	S.E. Mean	.11
Std Dev	1.5	Variance	2.4
Kurtosis	1.3	S.E. Kurtosis	.35
Skewness	1.5	S.E. Skew	.17