

**Stage-of-Change of Smoking Acquisition in
South African High-School Adolescents:
A Cross-Sectional Study of Decisional Balance,
Temptation and Perceived Social Norms.**

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ABSTRACT

This study aimed to use the Transtheoretical Model of behaviour change (Prochaska and DiClemente, 1983) to investigate the process of smoking initiation in a cross-section of high school adolescents in urban KwaZulu-Natal. This aim was informed by the increase in incidence of smoking among adolescents, who represent a particularly vulnerable population to smoking (Orlandi and Dalton, 1998). The Transtheoretical Model has proved successful in changing problem health behaviours (Prochaska and DiClemente, 1983) and lends itself to be a suitable framework for investigating smoking acquisition in adolescents (Werch and DiClemente, 1994). An extensive review of the causes and correlates of smoking uptake and past intervention evaluations suggests that the core constructs of the TTM (Decisional Balance, Temptation and Stage of Acquisition) can be complemented by other another variable, Perceived Social Norms (informed by the Theory of Planned Behaviour, Fishbein and Ajzen, 1975, as cited in Pitts, 1996), to provide a more holistic explanation of smoking acquisition. Alcohol use, parental smoking and certain demographic factors are also found to be salient factors in this process. Findings showed that the perceived cons of smoking were constant across stages and seemed to have no effect on stage membership. Stage differences were explained almost entirely in terms of pros, which increased drastically with later stages. Perceived social norms increased with a later stage, confirming a tentative theoretical relationship between the Transtheoretical Model and Theory of Planned Behaviour. Lack of expressed intention to smoke by participants questions the validity of using the rational decision-making Transtheoretical Model to investigate a process not informed by decision-making. European language speakers were found to be a particularly vulnerable group to smoking, while African language speaking girls show very low rates of smoking. High religiosity was found to be a protective factor, while alcohol use was strongly associated with smoking. Maternal smoking was strongly associated with smoking, but only in girls. No difference in stage was found between schools and grades. The study should be replicated using a longitudinal design to determine the causal relationship between factors and smoking and to further investigate the applicability of the Transtheoretical Model in smoking acquisition.

DECLARATION

Unless specifically indicated to the contrary, this project is the result of my own work.

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STAGE OF CHANGE OF SMOKING ACQUISITION IN SOUTH AFRICAN HIGH-SCHOOL ADOLESCENTS:

A Cross-sectional Study of Decisional Balance, Temptation and Perceived Social Norms.

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INTRODUCTION

The motivations behind attempts to prevent adolescent smoking are obvious. It is not news that smoking poses a serious health risk to individuals and makes a substantial contribution to the global burden of illness (UNF, n.d.). However, it is adolescents who are at the forefront of the list of recipients for tobacco prevention interventions. This is for a number of reasons. Firstly, recent research shows an increase in the incidence of adolescent smoking (CDC, 1999) and confirms adolescents as a high-risk group for acquiring smoking (Altman and Jackson, 1998). Secondly, the primary prevention framework suggests that it is better to prevent the damaging effects of health-risk behaviours before they occur (Pitts, 1996) making adolescence the primary period for smoking prevention interventions. Therefore, interventions aimed at reducing adolescent smoking incidence and reducing the harm caused by smoking are thus paramount in combating the smoking epidemic.

However, for interventions to be successful, they need to be informed by clear, accurate research into the process of adolescent smoking acquisition (Werch and DiClemente, 1994). Winnett, King and Altman (1989) suggest that a framework for preventing health-risk behaviour should draw on both the ecological theory of the Public Health framework and the in-depth understanding of human action of Health Psychology. It is well established in the literature that the causes of smoking are numerous and involve the complex interplay of many

factors (Leventhal and Cleary, 1980), and a framework for understanding that reflects this is needed.

One theory that involves a subtle understanding of the processes of health behaviour is the Transtheoretical Model [TTM] (Prochaska and DiClemente, 1983). Originally designed as a stage model to explain the process of quitting smoking, this model has been shown to be a suitable framework for understanding smoking acquisition (Pallonen, Prochaska, Velicer, Prokhorov and Smith, 1998; Werch and DiClemente, 1994). The major advantage of the TTM is stated by one of the authors: "Change implies phenomena occurring over time, but, surprisingly, none of the leading theories of [behaviour change] contained a core construct representing time. Behaviour change was often construed as an event, such as quitting smoking, drinking, or overeating" (Prochaska, Johnson and Lee, 1998, p. 60). The advantage of a stage model therefore, where starting smoking is seen as occurring over a series of qualitatively different stages, is that it allows for analysis of the numerous factors affecting smoking at each stage of acquisition, thereby permitting the development of interventions that are specifically suited to people in each stage of smoking. These *stage-matched* interventions (Prochaska et al., 1998) are better than generic interventions as each stage is characterised by a unique set of concerns, attitudes and practices. Therefore what is successful for those in one stage may not work for those in another.

However, one major criticism of the TTM stands out here. This model is based primarily on psychological, rational decision-making and offers limited explanation of social-normative factors in smoking acquisition – despite these being salient factors in smoking acquisition (Marks, Murray, Evans and Willig, 2000) and interventions using a social-normative approach having the highest success rate (Rooney and Murray, 1996). However, one model

does provide an explanation of these factors: the Theory of Planned Behaviour (Fishbein and Ajzen, 1975, cited in Pitts, 1996). According to the Theory of Planned Behaviour, behaviour is predicted by a behavioural intention, which is in turn predicted by several factors including the perception of the social norm regarding that behaviour. The premise of this theory is that an intention to perform a behaviour is the “product of the expectation that important others will consider the performance of behaviour important and the value of the person’s approval” (Marteau, 1989, p. 4). This concept of perceived social norms will therefore be incorporated into the TTM as a framework for investigating the process of adolescent smoking acquisition.

Using this framework, this study planned to use a cross-section of adolescents from several schools and different demographic backgrounds and place them into smoking stages using the Transtheoretical Model. These stage-groups will then be compared on the basis of several Transtheoretical constructs, namely the relative weighting of perceived benefits and risks of smoking and temptations to smoke, perceived social norms and a host of personal, social and environmental factors previously associated with smoking. This analysis will investigate the factors influencing smoking at each smoking stage, thus allowing the creation of holistic stage-matched interventions.

A questionnaire has been designed which, using dichotomous and 5-point Likert scale items, obtained measures of the constructs mentioned above. The data obtained from this questionnaire were analysed statistically using SPSS. Comparisons of group means were done using the ANOVA procedure, and associations between groups were determined by the χ^2 statistic.

An investigation of adolescent smoking using this model will have a number of theoretical and practical implications. Firstly, the integration of a scale of perceived social norms with the Transtheoretical Decisional Balance and Temptation constructs offers a possible improvement to the explanatory power of the TTM with regards to smoking acquisition. A salient criticism of the TTM, mentioned above, is its lack of consideration of the normative influences in smoking acquisition, therefore including a perceived social norms measure may provide a better theoretical basis for the explanation of smoking acquisition. In addition, this suggests the possibility of combining the TTM with the Theory of Planned Behaviour (Fishbein and Ajzen, 1975, cited in Pitts, 1996) from which the perceived social norms scale originates – a theoretical advance also suggested by Holtgrave, Tinsley and Kay (1995) and Werch and DiClemente (1994).

Secondly, as the application of the TTM to smoking *acquisition* is a relatively new concept, it is necessary to establish a solid empirical basis for the relationship between the acquisition stages and the Decisional Balance and Temptation constructs. As previous researchers in this area have suggested, “[I]t is necessary to indicate the empirical data of more beginning periods on smoking acquisition in various populations and nationalities” (Otake and Shimai, 2001, p. 631). The application of the TTM to smoking acquisition in South African adolescents is therefore necessary to provide further empirical support for the TTM.

In addition to these theoretical implications, this study will have valuable practical implications. Comparing various demographic groups on the basis of Acquisition Stage and associating other factors with each stage will provide useful information for the creation of stage-matched smoking prevention programmes.

REVIEW OF LITERATURE

The Extent and Cost of Smoking

Since Doll and Hill (1952, cited in Marks, Murray, Evans and Willig, 2000) first linked the practice of cigarette smoking to cancer, smoking has become an area of keen interest in both medical and behavioural disciplines (e.g. Marks et al., 2000; Pitts and Phillips, 1998).

Smoking represents a significant health threat of pandemic proportions with more than four million annual tobacco-related deaths (United Nations Foundation [UNF], n.d.). Currently, tobacco-related deaths are the second highest cause of mortality globally, and are expected to account for the highest proportion of deaths by 2020 (UNF, n.d.) and are projected to cause 10 million annual deaths worldwide by 2025 (Swart, Reddy and Stein, 1998). The tar inhaled during smoking cigarettes has been proven to cause cancers of the mouth, throat and lungs, reduce lung capacity, increase the likelihood of contracting illnesses such as bronchitis, and cause more severe and prolonged symptoms of the common cold (Parrott, 1998). Smoking tobacco increases the inhalation of carbon monoxide [CO] gas, a highly toxic substance that reduces the amount of oxygen carried by the bloodstream (Parrott, 1998). Environmental tobacco smoke has similar effects on non-smokers around a smoking person, especially in enclosed environments (Parrott, 1998).

Following a four-decade long decrease in smoking prevalence in the Western world since Doll and Hill study (1952, as cited in Marks, Murray, Evans and Willig, 2000), there has been an increase in adolescent smoking incidence internationally, especially among young women (Altman and Jackson, 1998; Marks et al., 2000; WHO, 2003). The current 1.2 billion

smokers (UNF, n.d.) therefore pose an enormous challenge to health care systems worldwide, both in terms of costs associated with tobacco-related illness and subsequent loss of productivity, and in terms of premature loss of human life (Orlandi and Dalton, 1998). Altman and Jackson (1998) suggest that the extent of this epidemic is underestimated by the general population, despite many decades of health information promotion.

Swart, Reddy and Stein (1998) of the Medical Research Council of South Africa cite that the cost of loss of economic productivity and public-sector tobacco-related illness in South Africa in 1994 amounted to more than R4 billion, and caused over 25 000 deaths in 1990. In 1995, 34% of South African adults smoked, with the highest prevalence being among 'coloureds' living in the Western Cape province (Swart et al., 2001). Flisher, Parry, Evans, Muller and Lombard (2003) investigated the prevalence rates of smoking and other substance use among high-school adolescents in Cape Town, also finding a high rate of smoking among coloureds. These authors found prevalence rates of smoking in the past month ranging from 3.5% for black girls in grade eight to 46.5% for grade 11 boys. Notable differences were found between the prevalence of black boys and black girls, who showed a much lower prevalence of smoking than all other racial groups and males. The overall prevalence rate for all participants was found to be 27% (Flisher et al., 2003). In the Northern Province of South Africa, Madu and Matla (2003) found an overall ever-smoking prevalence of 10.6% for black high-school students between 15-19 years old. A significant gender difference in prevalence was also found, similar to the findings of Flisher et al. (2003). Among rural high-school pupils in KwaZulu-Natal, 13.1% of participants were found to smoke on a daily basis (Taylor, Jinabhai, Naidoo, Kleinschmidt and Dlamini, 2003). In all studies, smoking was significantly associated with other substance use (Flisher et al., 2003; Madu and Matla, 2003;

Taylor et al., 2003) indicating that the problem of cigarette smoking is interwoven in a larger context of substance abuse with possible shared mediating causal factors.

Gender differences in smoking prevalence

As mentioned above, smoking in South Africa is associated more with men than women (Flisher, Parry, Evans, Muller and Lombard, 2003; Madu and Matla, 2003). A higher smoking prevalence among men has also been the trend in the Western world (Marks, Murray, Evans and Willig, 2000). However, since the 1990s, an increase in the incidence of female smoking has been noted (Boyd, Boyd and Greenlee, 2003; Marks et al., 2000; Seguire and Chalmers, 2000). This has been variously attributed the role of tobacco marketing targeting women (Boyd et al., 2003), the emergent values of female empowerment as 'taking over' traditionally masculine behaviours (Boyd et al., 2003) and, in a society where female slimness is valued, smoking functions as a weight control mechanism (Boyd et al., 2003; Marks et al., 2000; Seguire and Chalmers, 2000).

This increase in female smoking is evident in the South African context in the relatively equal smoking rates of male and female whites (Flisher et al., 2003) and is especially salient in the alarming 300% increase in smoking among coloured women since the 1980s (Swart, Reddy and Stein, 1998). The prevalence of smoking in black women, however, seems to have remained relatively low (Flisher et al., 2003) despite rates of alcohol use more similar to, though still significantly different from, black men (Madu and Matla, 2003).

Smoking, therefore, constitutes a significant health risk and affects a large number of people, both nationally and worldwide. Suitable interventions are therefore needed to reduce the

prevalence and incidence of smoking and promote the health of people in South Africa – as well as minimising the harmful aspects of smoking to smokers and non-smokers alike (MacCoun, 1998) These interventions should be aimed especially at adolescents who constitute a particularly vulnerable population to smoking (Orlandi and Dalton, 1998; WHO, 2003).

The Health Promotion Framework and Smoking Interventions

It is clear from the above review that smoking poses a significant threat to health on a global and national scale. Smoking related illness, however, like the majority of causes of morbidity in the Western world, is the result of behavioural and lifestyle factors – not an infectious disease – and thus requires interventions targeting behavioural pathogens (Orlandi and Dalton, 1998). The role of behaviour and lifestyle has thus been a long-standing area of investigation in a variety of disciplines, from public health to behavioural medicine to health psychology (Winnett, King and Altman, 1989). What these different disciplines share is the common belief that illness is better prevented initially than treated at a later stage – the notion of primary prevention (Pitts, 1996). The implications for smoking, therefore, are that it is a problem best dealt with by promoting healthy behaviours, where health promotion is defined as the combined contributions of psychological, sociological and environmental interventions aimed at influencing lifestyle (Orlandi and Dalton, 1998).

The practice of designing and implementing interventions promoting healthy behaviours and preventing health risk behaviours is largely interdisciplinary (Winnett et al. 1989) and involves contributions from historically separate disciplines in order to understand the

complex processes underlying many behavioural illnesses, including smoking (Winnett et al., 1989; Altman and Jackson, 1998). The framework for understanding smoking as a behaviour leading to physical illnesses (such as coronary heart disease, lung cancer), as understood in this project, is informed by health psychology and public health.

Public health is a long-established field initiated out of a moral responsibility to promote health, prolong life and prevent disease by policy interventions and creation of social services to facilitate a healthier environment and society in which people might live (Winnett, King and Altman, 1989). Health Psychology, on the other hand, is a more recently emergent field (Marks, Murray, Evans and Willig, 2000; Pitts and Phillips, 1998) and is concerned with the role of behaviour and psychology as it impacts on physical health (Pitts, 1996; Prochaska and DiClemente, 1983). Winnett et al. (1989) suggested that the newly emergent field of Health Psychology could make numerous contributions to Public Health and *vice versa*. On one hand, the field of Public Health can offer a detailed knowledge of the socio-political environmental influences on health; on the other hand, Health Psychology has a long history of involvement in behavioural change and can contribute a more subtle understanding of how individual change occurs (Winnett et al., 1989). More recently, numerous practitioners dealing with smoking interventions have similarly called for interventions aimed at multiple levels (policy, environment, psychological, skills training, and so on) in order for these interventions to be effective (Altman and Jackson, 1998; Orlandi and Dalton, 1998; Werch and DiClemente, 1994). An understanding of both environmental and individual factors is thus essential.

Within the public health discipline, however, there exists some debate about the means through which the goal of reducing the harm caused by the use and abuse of dangerous

substances should be reached. MacCoun (1998) describes a tension within public health between preventing a behaviour, on the one hand, and reducing the harm caused by that behaviour, on the other. Broadly, there are two ways in which the overall harmful impact of substance use can be minimised. The first, more commonly used approach, according to MacCoun (1998), involves sanctioning the use of the substance, limiting its supply and generally aiming to reduce the prevalence – prevention of the behaviour. The other approach involves implementing policies aimed at reducing the harm per use of the drug.

In the context of smoking, harm reduction would involve measures such as having separate smoking areas to reduce exposure of non-smokers to environmental smoke, or the legislation of the amount of tar permitted in each cigarette. Harm reduction therefore does not aim at reducing prevalence, but rather adopts the more pragmatic view that one can do little to stop people smoking entirely, but can take measures to minimise the harmful effects of smoking. As MacCoun (1998) illustrates, however, these two strategies can be counterproductive to each other. A gain in prevalence reduction may cause greater harm to users and *vice versa*. For example, the prevalence reduction strategy of banning sale of cigarettes to minors may have the effect of increasing harm to adolescent smokers as they may be less likely to seek out help in quitting for fear of punishment and therefore progress to a more advanced stage of smoking. On the other hand, the harm reduction strategy of designing cigarettes with more effective tar filters and especially the promotion of “light” cigarettes has been suggested to have increased the incidence of smoking by making it appear less risky (e.g. Ling and Galantz, 2002b; MacCoun, 1998).

Despite the apparent incompatibility of these two strategies, MacCoun (1998) suggests that reaching public health goals should entail both harm reduction and prevalence reduction

strategies. Policies around cigarette smoking are prime examples of incorporating both prevalence and harm reduction. An example of prevalence reduction strategies would be the numerous smoking prevention and cessation programmes (e.g. Bauman, Foshee, Ennett, Hicks and Pemberton, 2001; Griesbach, Inchley and Currie, 2002; Koumi and Tsiantis, 2001; Werch and DiClemente, 1994). The examples of harm reduction strategies are also numerous. As mentioned above, cigarettes with filters are designed to reduce the intake of harmful substances by smokers (MacCoun, 1998). Having separate smoking and non-smoking areas in public places aims to reduce the harmful effects of environmental tobacco smoke on non-smokers. One frequently cited criticism of these harm reduction methods is that they may unintentionally lower the perceived negative consequences of smoking, thereby increasing the incidence (MacCoun, 1998). However, MacCoun reports that these criticisms are unfounded since studies in the field of harm reduction generally show that the net reduction in overall harm outweighs the consequences of a slight rise in prevalence.

This research project, therefore, accepts a framework for understanding the practice of smoking as a process influenced by multiple psychological, social, biological and contextual factors. Public health strategies employed to prevent the loss of health and life associated with smoking should therefore be informed by research that is interdisciplinary and that examines factors from a variety of spheres. Furthermore, preventative strategies should aim to both reduce smoking prevalence and the immediate harm associated with cigarette smoking. This will therefore be reflected in the aim of this research project, which is to inform interventions designed to prevent and reduce the negative consequences of adolescent smoking.

The Importance of Adolescence in Smoking Acquisition

Much research has gone into understanding the complex ontogeny of smoking (e.g. Leventhal and Cleary, 1980; Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura, 2002). One clear finding that has emerged is that adolescence is a period of huge importance in the initial uptake of smoking (Alexander, Piazza, Mekos and Valente, 2001; Altman and Jackson, 1998; Leventhal and Cleary, 1980; Marks, Murray, Evans and Willig, 2000; Orlandi and Dalton, 1998). Furthermore, recent epidemiological research suggests that the incidence of smoking among adolescents is increasing, with the number of teens in the USA smoking daily increasing 73% from 1988 to 1996 (Center for Disease Control and Prevention [CDC], 1999). Altman and Jackson (1998) suggest that tobacco smoking almost invariably begins with experimentation in adolescence. They cite a study by Lynch and Bonnie (1994) suggesting that of regular adult smokers, 37% started before the age of 14 and 89% had started smoking before 18 (Altman and Jackson, 1998). Similarly, Chassin et al. (1996, cited in Marks et al., 2000) found, in a longitudinal study, that 59.9% of adolescent smokers went on to smoke in adulthood, whereas only 9.6% of adolescent non-smokers took up smoking in adulthood. Furthermore, an earlier progression to regular smoking is associated higher rates of nicotine dependence in adulthood (Stanton, 1995, cited in Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura, 2002).

The implications of these findings in the context of a health promoting, primary prevention framework are that the problem of smoking is best dealt with by preventing adolescents from initially acquiring smoking behaviour. Orlandi and Dalton (1998) have expressed a number of advantages to early lifestyle interventions. Firstly, they suggest that many of the behavioural patterns associated with smoking are established in childhood. In fact, some

authors suggest that smoking interventions should target children as young as those in the 5th grade as the perceptions predictive of subsequent smoking are already established at this age (Dinh, Sarason, Peterson and Onstad, 1995). Pfau (1995), also a proponent of early interventions, reports that most 6th and 7th grade children harbour strong anti-smoking sentiments which should be used constructively as a basis for behavioural inoculation interventions. Secondly, Orlandi and Dalton (1998) point out that habitual behaviours, once performed by an individual for a long period of time, become more difficult to change and therefore earlier interventions where risky behavioural patterns have not yet become ingrained would be preferable. Thirdly, these authors cite evidence that physiological aspects of some smoking-related illnesses (like atherosclerosis) begin in childhood (Orlandi and Dalton, 1998).

In conclusion, smoking is a problem clearly related to adolescence and therefore preventative interventions should be aimed at this group to prevent the high subsequent costs associated with smoking (for example the US\$ 50 billion spent on healthcare costs associated with smoking in the USA annually; Altman and Jackson, 1998).

The Process of Acquisition

The acquisition of smoking is a hugely complex and much-researched process and is influenced by many interrelating physiological, psychological, emotional, social, political and environmental factors (Altman and Jackson, 1998; Marks, Murray, Evans and Willig, 2000; Orlandi and Dalton, 1998); therefore, teasing out the exact causal pathways involved in smoking acquisition is an extremely difficult task. However, a number of theories have been

developed within the context of health behaviour generally, and smoking specifically, which can help understand the smoking process. In addition there has been much research into the smoking process and thus there is a large body of evidence associating smoking with various biological, psychological and social factors. The following discussion will be of these theories of smoking and a critical evaluation thereof, after which the correlates of smoking will be discussed.

Theories of Smoking

There are numerous theories used to explain the process of smoking: the Health Belief Model (Becker and Maiman, 1975 cited in Pitts, 1996; 1998), the Theory of Planned Behaviour (Fishbein and Ajzen, 1975, cited in Pitts, 1996; 1998), Schwarzer's Health Action Process Approach (Pitts, 1998), the Transtheoretical Model (Prochaska and DiClemente, 1983), the Ecological Model (Altman and Jackson, 1998), Social Cognitive Theory (Bandura, 1986, as cited in Maibach and Cotton, 1995) and others. However, the discussion will be limited to the Health Belief Model, the Theory of Planned Behaviour, the Ecological Model, the Social Cognitive Model and the Transtheoretical Model as these enjoy the most widespread application and literary focus.

The Health Belief Model

The Health Belief Model [HBM] was originally developed as an explanation and predictive aid for engagement in health behaviour and heralded the beginning of attempts at systematically understanding health behaviour (McCormack Brown, 1999). An underlying assumption of the model is that action is taken as a result of the rational beliefs and decisions

made by an individual (Pitts, 1998). A behaviour is seen to be the outcome of three parallel processes: firstly, individual perceptions of personal susceptibility to the disease, the perceived seriousness of the disease and general values of health; secondly, modifying factors such as demographic and psychosocial factors and cues to action; and thirdly, the likelihood of action as determined by the perceived cost-benefit ratio of action (Pitts, 1996; 1998).

Major limitations of this model lie in the assumption that human action is based on rational informed decision-making (McCormack Brown, 1999). It has long been established, however, that merely providing individuals with information about health behaviour is no guarantee of promoting change (e.g. Werch and DiClemente, 1994). Furthermore, the HBM focuses exclusively on beliefs as initiators of action, ignoring the host of cultural, contextual and interpersonal factors involved in smoking acquisition (McCormack Brown, 1999).

The Theory of Planned Behaviour

Like the HBM, the Theory of Planned Behaviour [TPB] (Fishbein and Ajzen, 1975, cited in Pitts, 1998) emphasises individual rational planning and decision-making in taking health risk or preventive behaviours. Unlike the HBM, however, this theory does provide for the influence of social norms and peer-group influences on the acquisition of a behaviour (Pitts, 1998). Also, the TPB problematises the HBM assumption that attitudes (or beliefs) lead directly to behaviour (Pitts, 1998).

The core thesis of the TPB is that the single best predictor of action is an intention to perform that action (Fishbein, 1993, in Pitts, 1996). This intention is in turn predicted by three individual psychological variables (Pitts, 1998): firstly, the attitude to performing the

behaviour, which is an outcome of a similar process of evaluations and beliefs of the outcomes as the HBM; secondly, the perceived normative beliefs of the person's peer group around the behaviour in question; and thirdly, the individual's perceived efficacy-beliefs to be able to carry out the behaviour (Pitts, 1996; 1998). With regards to smoking acquisition, the perceived social norms regarding smoking are a highly influential factor (Higgins and Conner, 2003; Schofield, Pattison, Hill and Borland, 2001) – an issue that will be discussed further later.

However, the TPB has been criticised, like the HBM, for downplaying the role of situational factors on behaviour and assuming that rational decision-making forms the basis for behaviour (Pitts, 1998). Furthermore, the TPB assumes intention always leads to behaviour whereas the reality may be that many external factors may limit a person's capacity to carry out an action (Pitts, 1998).

The Ecological Model

An understanding of health behaviour addressing the issue of the effect of contextual and environmental factors on behaviour would be that of the Ecological Model [EM] (Altman and Jackson, 1998). Whereas the HBM and TPB are influenced strongly by psychological theory and understandings of behaviour, the EM takes the view of behaviour that has developed out of a Public Health perspective (Winnett, King and Altman, 1989). The central philosophical premise of this model is that behaviour does not occur in a vacuum and accordingly the EM accounts for how the physical environment influences people at individual, social, community and policy levels (Altman and Jackson, 1998). A major advantage of this model, especially in the context of smoking, is that it can successfully be used to understand and plan

interventions in addressing the multitude of complex processes involved in smoking (Altman and Jackson, 1998; McCormack Brown, 1999). As discussed previously, however, many authors suggest that successful interventions aimed at smoking prevention require the respective contributions of both psychological and ecological theories (e.g. Winnett, et al., 1989).

Social Cognitive Theory

If the HBM and TPB consider personal factors in the determining of behaviour, and the EM considers the environmental factors, Bandura's (1986 as cited in Maibach and Cotton, 1995) Social Cognitive Theory [SCT] focuses on the reciprocal determinism of personal factors, environmental factors and behaviour. This model has enjoyed widespread usage due to its comprehensive inclusion of both environmental and personal factors in behaviour, and its parsimonious set of factors used to explain why people change (Maibach and Cotton, 1995). The core constructs include personal knowledge, skills, self-efficacy, outcome expectations and personal goals, and environmental factors from the social, institutional and physical domains (Maibach and Cotton, 1995). This theory improves upon the HBM and TPB by highlighting the reciprocally influencing manner in which the person and environmental are related thereby adding an additional dimension to the understanding of health behaviour.

Stage Models

These three theories discussed above each make significant contributions to the understanding of behaviour change. However, these theories can all be criticised along a common dimension: namely, the dimension of time. These theories tend to view the change

from non-smoker to smoker and *vice versa* as a discrete happening; there is very little focus on the process of change (Pitts, 1998). A person's decision to change their behaviour is seen as the outcome of the combined influence of attitudes and beliefs, which are assumed to be constant from the initial learning of the threat to the undertaking of action (Holtgrave, Tinsley and Kay, 1995). This understanding of change as a process has led to the development of a number of theories collectively referred to here as the stage paradigm¹.

As Prochaska, Johnson and Lee (1998) state the case: "Change implies phenomena occurring over time, but, surprisingly, none of the leading theories of therapy [behaviour change] contained a core construct representing time. Behaviour change was often construed as an event, such as quitting smoking, drinking, or overeating" (p. 60). However, Prochaska and DiClemente (1983) have conducted studies into the nature of the process of quitting smoking and have found that behaviour change is not a discrete event resulting immediately from a rational decision as suggested by the HBM and TPB, but occurs gradually over a series of progressive stages. Leventhal and Cleary (1980) were the authors of the seminal review of smoking theories *The Smoking Problem* describing smoking as a process occurring across several stages. These authors argued that up until that time, smoking interventions had largely been failures partly due to "ignoring the processes underlying smoking" (Leventhal and Cleary, 1980, p. 382) and make recommendations that future interventions take the into account the different factors important at each stage of smoking. Similarly, Mayhew, Flay and Mott (2000) in their review of stage-based theories of smoking, have posited that different stages can be predicted by a variety of psychosocial and environmental factors.

¹ However, this does not imply that the stage model is incompatible with other behavioural theories. For example, the stage model has been applied to health message design in combination with behavioural decision-making models such as the HBM and TPB (Holtgrave, Tinsley and Kay, 1995) and SCT (Maibach and Cotton, 1995). Werch and DiClemente (1994) have integrated the Stages of Change model into acquisition and cessation stages and illustrated which components of the HBM, Social Learning Theory and Behavioural self-control theory are applied at each Stage of Change.

An advantage of the stage conceptualisation of smoking, therefore, is that the concept of starting smoking or quitting smoking can be viewed as the complex process that the evidence suggests that it is (e.g. Leventhal and Cleary, 1980), instead of a simple event occurring as a result of the weight of factors occurring prior to the change as in the HBM and TPB (Pitts, 1998). This conceptualisation is useful for the designing of effective prevention and cessation interventions because the programmes can be stage-matched, that is tailored to the unique needs of a person in a particular stage of change (Prochaska, Johnson and Lee, 1998). Prochaska et al. (1998) have identified lack of specificity to stage-of-change in traditional interventions as a major cause of past program failures. Developing stage-matched interventions that specifically target the factors identified as salient at that stage of change is thus a huge advantage to the efficacy of interventions (Prochaska et al. 1998). Furthermore, the evaluation of interventions is more meaningful with a stage-based conceptualisation of smoking because meaningful gains may be made by an intervention in terms an individual's level of knowledge or intentions to quit, but these would not register as a successful outcome on a traditional intervention where the criteria for success would be a discrete reduction in smoking (Werch and DiClemente, 1994).

Stage models of change have been conceptualised by various authors, many of whom have used different criteria for defining stages and different names for the stages (Mayhew, Flay and Mott, 2000). Mayhew et al. (2000) have expressed difficulty in reviewing various studies using stage models because of the disparity of theories. In the present review of literature, two broad conceptualisations of Stages of Change have emerged. Firstly, Leventhal and Cleary (1980) proposed the stages of Preparation, Initiation, Becoming and Maintenance in smoking acquisition. Similarly, other authors have differentiated stages from Preparation,

Initial Trying, Experimentation, Regular Use and Addictive Use (e.g. Flay, 1993 cited in Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura, 2002). The second stage conceptualisation comes from the authors Prochaska and DiClemente (1983) and their Transtheoretical Model which involves the stages of Pre-Contemplation, Contemplation, Preparation, Action and Maintenance. Mayhew, Flay and Mott (2000) have reviewed stage-based models of adolescent smoking and have integrated the variety of stage conceptualisations into Pre-Contemplation, Contemplation/Preparation, Initiation/Trying, Experimentation/Becoming, Regular and Established smoking.

One stage-model has enjoyed particular popularity and empirical support (Marks, Murray, Evans and Willig, 2000) in the arena of behaviour change: the Transtheoretical Model [TTM] (Prochaska and DiClemente, 1983). Due to its widespread use and influence, and its lack of use on smoking acquisition in South Africa, the TTM has been selected for use as a framework for understanding smoking uptake in this project. The following section will give an outline of the TTM and its empirical referents, and discuss its usefulness in preventing adolescent smoking.

The Transtheoretical Model of Behaviour Change

The Transtheoretical Model [TTM] was originally developed as a means for understanding how individuals change health-risk behaviours, and arose from the systematic review and empirical testing of more than 150 theories of behaviour change (Prochaska, Johnson and Lee, 1998) – a process from which the term “transtheoretical” derives. A key feature of the

TTM is the stage conceptualisation of behaviour change, which was developed from research by Prochaska and DiClemente (1983) into how people quit smoking, both self-initiated and with professional help. The model focuses on intentional decision-making as its unit of analysis and is, in this way, similar to the HBM and TPB. Other factors in smoking such as policy, biological factors and social factors are viewed as external influences which act on the individual's decision-making processes (Velicer, Prochaska, Fava, Norman and Redding, n.d.). The TTM thus assumes that behaviour is principally a result of individual intention, although "chronic behaviour patterns are under some combination of biological, social, self-control [influences]" (Prochaska et al., 1998, p. 65).

The TTM involves a number of core constructs. Firstly, change is theorised to occur over six stages which are associated with the use of different cognitive and behavioural processes of change at different stages. These cognitive and behavioural processes are defined as activities that facilitate changes in thinking, feeling or behaviour (McCormack Brown, 1999; Velicer et al., n.d.) and are the processes used by people in changing an addictive behaviour (such as consciousness raising, counter-conditioning and stimulus control (Prochaska and DiClemente, 1983). Changes in stage are also associated with changes in measures of Decisional Balance – the relative weighing of Pros and Cons of change – which have been shown to predictably change across the stages according to different patterns for various health behaviours such as smoking, dieting and condom use (Prochaska, Johnson and Lee, 1998). The TTM also has Self-Efficacy and Temptation as core constructs, which are inversely related measures of the same idea (Velicer et al., n.d.), namely the situation-specific confidence (or lack of confidence) people have in their ability to maintain health promoting behaviours (Prochaska et al., 1998). These constructs are discussed in further detail below.

The TTM Stages of Change

The TTM views the smoking cessation process as occurring over six stages: Pre-Contemplation, Contemplation, Preparation, Action and Maintenance (Prochaska, DiClemente and Norcross, 1992). Each of these stages is systematically related to Decisional Balance, Self-Efficacy / Temptation and the processes of change in a unique and predictable way (Prochaska, Johnson and Lee, 1998). Velicer, Prochaska, Fava, Norman and Redding (n.d.) have defined Pre-Contemplation, Contemplation and Preparation in terms of intentions to act and Preparation, Action and Maintenance in terms of behavioural criteria. Quitting smoking therefore involves both thought and action in a progression from initial formation of negative attitudes towards smoking, to intentions to change, to ultimately taking action.

The first stage, Pre-Contemplation, is characterised by having no intentions to quit smoking within the next six months (Prochaska, Johnson and Lee, 1998). Smokers in this stage are unaware of the problem of smoking and are often labelled as resistant or unmotivated to change by traditional intervention programmes (Prochaska, DiClemente and Norcross, 1992; Velicer et al., n.d.).

The second stage, Contemplation, shows a progression to having knowledge of the problem and acknowledging the problem as affecting oneself but is characterised by not having made any commitments to change or actions to that end (Prochaska et al., 1992). Decisional Balance – the weighing of Pros and Cons – is particularly important in this stage, with contemplators showing high scores on both the Pros and Cons of change. Individuals therefore experience ambivalence about what course of Action to take (Prochaska et al., 1998) and, as a result, smokers are often stuck in the Contemplation stage for long periods of

time (Prochaska et al., 1992). A discrete measure of this stage is having an intention to change within the next six months (Velicer et al., n.d.).

Following Contemplation is a stage where the first behavioural outcomes of changing health behaviours can be observed – Preparation (Prochaska et al., 1992). Smokers in this stage have made a decision to quit smoking and have developed a specific plan of action to change (such as to enlist in a smoking cessation programme) (Prochaska et al., 1998). This stage is measured discretely by individuals' reports of having taken action in the past year and intending to take action in the next 30 days (Velicer, Prochaska, Fava, Norman and Redding, n.d.).

The Action stage, as the name suggests, is characterised by explicit and intentional action on the part of the smoker to reduce or quit smoking. Action aimed at quitting smoking involves individuals' modifications to their behaviour, experiences or environment (Prochaska, DiClemente and Norcross, 1992). Action is defined as having taken specific and observable steps within the past six months (Prochaska, Johnson and Lee, 1998). However, the criterion defining acceptable actions to constitute behaviour change are not defined by the individual in the process of changing, but rather by health experts (Velicer, Prochaska, Fava, Norman and Redding, n.d.). For example, reducing daily cigarette smoking by half might be the criterion defining the action stage.

After the Action stage, individuals come to a point where the focus is not so much on changing behaviour, but on preventing relapse and maintaining current preventative actions (Prochaska, Johnson and Lee, 1998); this is the stage of Maintenance. Characteristic of individuals in the Maintenance stage are higher scores of Pros of change, lower Temptation

and increased Self-Efficacy (Prochaska et al., 1998). Prochaska et al. (1998) suggest that evidence points to this stage lasting for up to five years, reflecting the struggle people often have in giving up smoking, before the final, almost idealistic stage of Termination where an individual experiences total Self-Efficacy and no Temptation to smoke in any situation (Prochaska et al., 1998).

These six stages do not represent a linear progression from smoker to non-smoker, but rather are cyclical in nature (Prochaska, DiClemente and Norcross, 1992). An individual is likely to go through several cycles of Pre-Contemplation, Contemplation and Preparation before engaging in Action, and may regress from a stage as advanced as Maintenance to any earlier stage (Prochaska, Johnson and Lee, 1998). This is in keeping with research cited by Prochaska et al. (1992) that suggests that smokers may make three or four attempts at taking action before proceeding to a stage of maintaining that change for any length of time. Marks, Murray, Evans and Willig (2000) likewise reported that 93% of smokers attempting to quit without treatment resume regular smoking within one year.

The issue of relapse constitutes an important component of the TTM, and relates to the health promotion concept of *harm reduction* (MacCoun, 1998). Essentially, the stage conceptualisation of behaviour modification proposed by the TTM is motivated by the realisation that the complete abstinence of a health-risk behaviour (such as smoking) may not be a realistic goal (at least not in the short term), and a more realistic goal of interventions should be to move smokers to a later stage of cessation (Prochaska, Johnson and Lee, 1998). Relapse is likely to occur from time to time, as stated above, but if at the end of the intervention a smoker is in a later stage of smoking cessation then the intervention is a success. Smoking prevention according to the TTM is thus concerned with harm reduction in

the short term by increasing motivation to quit, but has complete abstinence as an ideal goal for the long term (Prochaska et al., 1998). However, until an individual reaches the Termination stage, where abstinence is total and temptation is non-existent, the prevention of relapse becomes a significant issue (Witkiewitz and Marlatt, 2004). In the context of the TTM, relapse refers to preventing regression to an earlier stage of change. To this end, Witkiewitz and Marlatt (2004) have designed a cognitive-behavioural model of relapse prevention that incorporates the TTM constructs of levels of temptation to smoke in various “high-risk situations” (p. 230), self-efficacy beliefs to resist these temptations, the weighing-up of pros and cons of the form of outcome expectancies, and the use of psychological processes such as self-regulation and coping skills to explain relapse prevention.

The stage conceptualisation of behaviour change has a significant implication for intervention strategies. Based on a series of surveys, Velicer et al. (1995, cited in Prochaska et al., 1998) found that of smokers, 40% are in Pre-Contemplation, 40% are in Contemplation and the remaining 20% are in the Preparation stage of change. Prochaska et al. (1998) suggest that traditional intervention failure can be attributed to the fact that most interventions are aimed at moving people from the Preparation to Action stage. Traditional interventions, therefore, can only benefit at best 20% of the smoking population. This highlights the importance of designing *stage-matched* interventions, where the intervention strategies are aimed at the most influential factors affecting groups in different stages (Prochaska, DiClemente and Norcross, 1992; Prochaska et al., 1998).

The following section will discuss some of the factors in promoting behaviour change that are empirically associated with the TTM. These are the processes of change, Decisional Balance and Temptation / self-efficacy.

Processes of Change

Based on a review of over 150 theories of behaviour change in psychotherapeutic literature and practice, Prochaska and DiClemente (1983) found a total of ten cognitive and behavioural processes employed by individuals in both self-initiated and professionally-aided attempts at health behaviour change. Prochaska, Johnson and Lee (1998) stress the importance of these processes, likening them to “the independent variables that people need to apply to move from stage to stage” (p. 62). From the many processes proposed by the various theories Prochaska and DiClemente (1983) reviewed, ten emerged as most salient in both self-change and therapeutic change. These include experiential processes such as Consciousness raising, self-re-evaluation and dramatic relief, and behavioural processes such as stimulus control, counter conditioning and helping relationships (Prochaska, DiClemente and Norcross, 1992).

It is important to state at this juncture that these processes are those that people use in the cessation of smoking, and not the acquisition. As Prochaska, DiClemente and Norcross (1992) state the case: “change processes are covert and overt activities and experiences that individuals engage in to *modify problem behaviours*” (p. 1107, italics added). The processes involved in smoking uptake are different to those involved in cessation and will be discussed further in the section entitled “Smoking: Causes and Correlates”. Since this research project is concerned with smoking acquisition, the TTM processes will not be discussed further here. The interested reader is however referred to Prochaska and DiClemente (1983) and Prochaska, Johnson and Lee (1998) for an exhaustive discussion of them.

Temptation / Self-efficacy

Temptation and self-efficacy are constructs found to be associated in a systematic and predictable way with different stages of change (Velicer, Prochaska, Fava, Norman and Redding, n.d.). Self-efficacy refers to “situation-specific confidence that people have when they can cope with high-risk situations without relapsing to their unhealthy or high-risk habit” (Prochaska, Johnson and Lee, 1998, p. 64) and is based on Bandura’s (1977, cited in Prochaska et al., 1998) Self-Efficacy theory. Temptation, on the other hand, refers to situation-specific intensity of urges to engage in the health-risk behaviour (Prochaska et al., 1998). Temptation and Self-Efficacy are the inverse of each other, in other words a high Temptation score refers to an inversely proportional Self-Efficacy score and so, as a result, these constructs are interchangeable (Velicer et al., n.d.). Prochaska et al. (1998) have found, in numerous studies, that three common factors underlie Temptation. These are situations characterised by negative affect or distress, positive social situations such as parties or peer-smoking situations, and craving (Prochaska et al., 1998).

Unlike the processes of change construct, the Temptation construct has been shown to be applicable to the acquisition of smoking (Pallonen, Prochaska, Velicer, Prokhorov and Smith, 1998). Pallonen et al. (1998) have found that in earlier stages of smoking uptake social situations and curiosity were the more salient temptations, but regulation of negative affect became more important in later stages – probably as a result of the development of nicotine dependence (Parrott, 1999). Current and ex-smokers were also found to be significantly tempted by peer cigarette offers and negative affect (Pallonen et al., 1998). Similar findings were suggested by Sarason et al. (1992, cited in Marks, Murray, Evans and Willig, 2000), who reported that curiosity and social pressure was important in early stages, but addiction

and affect regulation were more important temptations later on. Plummer et al. (2001) found that smokers were tempted by negative affect, positive social situations, habit strength (craving) and weight control (in females). Weight control has emerged recently as an important factor in smoking uptake and is associated with the increased incidence of young female smokers (Marks, Murray, Evans and Willig, 2000; Boyd, Boyd and Greenlee, 2003). This association is largely attributed to tobacco marketing which associates cigarettes with slimness and sexual sophistication and popular discourse which purports the appetite suppressant properties of cigarettes (Boyd et al., 2003). Plummer et al. (2001) found the same four temptations salient in non-smokers, but also found curiosity and boredom as important factors.

In summary, several situations have emerged as common tempting factors for people to smoke. They are: positive social situations, negative affect regulation, craving, curiosity, boredom and weight control. Past applications of the TTM to smoking acquisition have suggested that overall temptation scores increase drastically from Pre-Contemplation to Action (e.g. Otake and Shimai, 2001). Otake and Shimai (2001) found significant increases between Pre-Contemplation and Contemplation and from Preparation to Action among both junior and senior high-school students in Japan, and these results were claimed to be similar to those obtained from other high-school populations (e.g. Elder, 1990, as cited in Otake and Shimai, 2001).

Decisional Balance

Decisional Balance refers to perceptions of the pros of smoking and perceptions of the cons of smoking. The assumption behind this construct is that individuals make decisions on the

basis of the relative weight of the perceived benefits and risks of taking the action in question (Velicer, Prochaska, Fava, Norman, Redding, n.d.). In the context of smoking acquisition some perceived pros would be the social benefits of smoking, such as fitting in, increased popularity, and so on. An example of a smoking con would be the perceived health risk associated with smoking. The TTM suggests that at each stage the relative levels of pros and cons are different, reflecting the ever-changing cognitive processes involved in smoking (Prochaska, Johnson and Lee, 1998). Each kind of health behaviour (e.g. over-eating, condom use) has a unique pattern of Decisional Balance. One of the aims of this study is thus to determine the nature of this pattern in South African adolescent smoking acquisition.

Some debate exists about the structure of the Decisional Balance construct. Prochaska et al. (1998) initially adopted a more complex structure of Pros and Cons adapted from Janis and Mann (1997, cited in Prochaska et al., 1998), but found in numerous studies that the simple Pros and Cons structure was most stable. Plummer et al. (2001), however, found a three-factor model of Decisional Balance in a high-school population consisting of social pros, coping pros and cons. Social pros refer to perceived social benefits of smoking, such as increased popularity for example. Coping pros are the perceived benefits of smoking that relate to coping with stressful situations or regulating negative affect. Pallonen et al. (1998) found that high coping pros of smoking scores were associated with the uptake of smoking, while high cons were associated with long-term quitters. Coping pros, therefore, were concluded to be important in smoking uptake. Marks, Murray, Evans and Willig (2000), however, suggest that the sample of 16-17 year olds used by Pallonen et al. may not be representative of younger adolescents where social pros may be more important. Dijkstra et al. (1998, cited in Marks et al., 2000) found four pros of changing: long-terms health pros, short-term health pros, social pros and self-evaluative pros. However, it seems that the

general consensus of the TTM is to use simply pros and cons as measures of Decisional Balance. This does not, however, preclude the possibility for more complex structures to underlie the pros and cons measures.

Past investigations of smoking acquisition have suggested that the perceived pros of smoking increase from Pre-Contemplation to Action, while the cons show a corresponding decrease (Otake and Shimai, 2001). In their study, Otake and Shimai (2001) found that the pros of smoking were lower than the cons in Pre-Contemplation, but were higher in all other stages. This pattern was similar for both senior and junior high school students. This pattern suggests that even a slight consideration of smoking by adolescents (Contemplation) will generally yield a Decisional Balance in favour of the pros of smoking – a fact that points to a social context providing adolescents with many more pro-smoking than anti-smoking messages.

Empirical Support for the TTM

Marks, Murray, Evans and Willig (2000) state that the TTM is the model of behavioural change enjoying most empirical support and widespread usage. Prochaska, DiClemente and Norcross (1992) cite numerous studies giving supporting evidence for the Stages of Change construct. These have involved cluster analyses of individuals using two different measures of stage-of-change: a discrete self-report measure using mutually exclusive questions of intentions and behaviours around smoking, and a continuous measure (Prochaska et al., 1992). The stage of change construct was supported by the cluster analyses based on both the discrete and continuous measures of stage of change (Prochaska et al., 1992).

Other authors have validated the TTM on different populations. Borland, Segan and Velicer (2000) found strong support for the internal validity of TTM constructs on a sample of Australian smokers, Otake and Shimai (2001) validated the TTM for use in smoking acquisition among Japanese high-school adolescents, and Chen, Horner and Percy (2003) found stages of tobacco acquisition and Decisional Balance to be valid in a sample of Taiwanese adolescents. Anderson and Keller (2002) found that smokers in the Pre-Contemplation and Preparation stages relied on specific process of change, but those in Contemplation displayed no predictable pattern – providing only partial support for the TTM. This study, however, relied on a small, convenience sample (n=79). Carlson, Taenzer, Koopmans and Casebeer (2003) found good predictive validity for the Stage of Change, Decisional Balance and Temptation constructs for smoking cessation over a three month period among out-patients at a community smoking cessation clinic. Plummer et al. (2001) found good support for measures of Decisional Balance, Temptation and stage of change for both smokers and non-smokers in a sample of adolescents (n=2 808). The Stage of Change construct was shown to be moderately reliable based on intention to start or quit smoking over a six month period among a group of 13-14 year old adolescents (Aveyard, Lancashire, Almond and Cheng, 2002). Likewise, Prokhorov et al. (2002) found good support for the Stages of Change construct of the TTM in adolescent smoking initiation based on both prospective and cross-sectional data. Carbonari, DiClemente and Sewell (1999) also used a 30 month longitudinal design to validate TTM Stages of Change construct, finding evidence for both the presence of stages and their utility in understanding smoking cessation, and the spiral pattern of stage transition proposed by Prochaska, DiClemente and Norcross (1992).

Several studies have confirmed the validity of the Stage construct, but have suggested the incorporation of additional sub-grouping within the Pre-Contemplation stage. Kremers,

Mudde and de Vries (2001) suggested that sub-types existed within the Pre-Contemplation stage and Prokhorov et al. (2002) suggested that even better predictive validity could be achieved by integrating Stages of Change with the construct of Susceptibility in the Pre-Contemplation group. The concept of Susceptibility was developed by Leventhal and Cleary (1980), who suggested that reasons for beginning smoking could be classified into a number of “preparatory sets” (p. 384) and reflect different underlying factors making the different groups susceptible. Thus, the findings of Prokhorov et al. (2002) suggest two parallel “streams” of Pre-contemplators, each with different factors making them susceptible to smoking and thus requiring different strategies to prevent them from smoking. In conclusion, the TTM and its constructs of Temptation and Decisional Balance show good empirical support for both smoking and non-smoking populations, and are therefore applicable equally to smoking initiation as well as cessation.

Criticisms of the TTM

Despite having good empirical support on adults and adolescents, different national groups and smokers and non-smokers, the TTM nevertheless has a number of critics. Several authors have criticised the validity and reliability of the TTM constructs. Stutton (2001) has argued that there is little evidence for the Stages of Change construct and has reviewed evidence from cross-sectional comparisons of stages, longitudinal stage predictions and experimental studies of stage-matched against stage-mismatched interventions. Stutton (2001) argues that the balance of the evidence point to the abandonment of the TTM, both theoretically and practically. Armitage and Arden (2002) have argued in favour of the Theory of Planned Behaviour [TPB] over the TTM but have, however, illuminated a relationship between TPB variables and Stage of Change. Their conclusions, despite this finding, were that TTM is at

best a proxy measure of behaviour change and that the TPB explains the change process better. Likewise, Littrell and Girvin (2002) and Mayhew, Flay and Mott (2000) have argued that the Stages of Change construct has poor reliability and validity. Littrell and Girvin (2002) suggest that there is little evidence supporting the structure and movement through stages, and that the stages are not mutually exclusive. Bandura (1997, cited in Marks, Murray, Evans and Willig, 2000) has criticised the stages as being artificial and not representing the dynamic process of change.

As well as questioning the validity of the TTM constructs, the model has also come under criticism for being primarily a psychological theory and giving less emphasis to the host of other social, biological and environmental influences also associated with smoking (Marks, Murray, Evans and Willig, 2000). However, most authors (e.g. Littrell and Girvin, 2002; Otake and Shimai, 2001) concede that the TTM has heuristic value in the design of research interventions (Marks et al., 2000) and represents a robust approach to understanding the modification of problem behaviours (Otake and Shimai, 2001).

Applications of the TTM in Smoking Acquisition

Although the TTM was originally designed as a tool to understand the complex processes underlying behaviour change in the context of smoking cessation (Prochaska and DiClemente, 1983), there is good evidence that it is applicable in the context of smoking acquisition. Werch and DiClemente (1994) for example, suggest that “the stage framework is ripe for expansion and application ... to the initiation of behavior and habit acquisition” (p. 38) and go on to produce a framework based on the TTM for designing health behaviour interventions for people in any stage of smoking acquisition or cessation. Indeed, some of the

first authors to review the literature of smoking acquisition, Leventhal and Cleary (1980), used a stage-based model for understanding the processes involved. Mayhew, Flay and Mott (2000) have more recently reviewed numerous studies of stage-based smoking acquisition and summarise various predictors of stage transition in the reviewed studies. They furthermore suggest that the TTM stage approach to smoking acquisition is the one with the best supporting evidence.

Several authors have conducted studies using the TTM constructs in smoking acquisition. Pallonen, Prochaska, Velicer, Prokhorov and Smith (1998) have expanded the TTM Stages of Change into a continuous nine-stage model of acquisition and cessation where Pre-Contemplation, Contemplation and Preparation are acquisition stages. Werch and DiClemente (1994) have defined parallel stages of Pre-Contemplation, Contemplation, Action and Maintenance for both smoking acquisition and cessation. Werch and DiClemente (1994) refer to three previous studies supporting the use of the TTM in smoking (or other substance) uptake (Glynn et al., 1985; Stern et al., 1987; Werch et al., 1992, all cited in Werch and DiClemente, 1994). Using a similar stage conceptualisation to that of Werch and DiClemente (1994), Otake and Shimai (2001) have applied the TTM constructs of Stages of Change, Decisional Balance and Temptation / Self-Efficacy to smoking acquisition on a population of junior and senior Japanese high-school adolescents, and found these constructs to be a valid and useful index of smoking acquisition.

One construct of the TTM, however, has not been tested on smoking uptake to our knowledge: the cognitive and behavioural processes of change (Prochaska, Johnson and Lee, 1998). These processes, however, refer to processes people use in the cessation of problem behaviour and originated in psychotherapeutic practice, and are thus not, by definition, likely

to be applied in the acquisition of smoking. This highlights a fundamental difference between using the TTM for cessation and using it for acquisition. One of the core assumptions of the TTM in the case of smoking cessation is that individuals are not inherently motivated to move from a Pre-Contemplation stage to Maintenance, but rather need external prompting and assistance to do so (Prochaska et al., 1998). In the case of smoking uptake, however, there are a plethora of factors (to be discussed in the subsequent section on the causes and correlates of smoking) that promote the uptake of cigarette smoking. The TTM processes mentioned above are designed to move individuals through to later stages; the object of smoking prevention, on the other hand, is to prevent movement through to later stages, or to promote regression to earlier stages (Werch and DiClemente, 1994).

Werch and DiClemente (1994), who have applied the TTM to smoking acquisition with the expressed purpose of designing preventative interventions, define the five stages of smoking acquisition as follows: *Pre-Contemplation* is the stage where the individual is not considering smoking at all. *Contemplation* is defined by serious consideration of cigarette use in the future, which leads into *Preparation*, defined by the individual having a behavioural intention (similar to the concept found in the TPB) to start smoking soon. The first three acquisition stages – Pre-Contemplation, Contemplation and Preparation – illustrate the gains the TTM has over non-stage-based models of acquisition because the process of smoking is recognised as beginning well before any actual smoking occurs. As Leventhal and Cleary (1980) state: “[S]moking’ begins well before a child tries a first cigarette. Children develop attitudes about smoking and have images of what smoking is like well before they try it” (p. 384). The TTM stage conceptualisation allows these pre-Action stages to be measured and differentiated as valid periods in the process of smoking initiation.

Following the first three stages, where no (or very little) smoking behaviour has yet occurred, the *Action* stage is defined by the first purposeful usage of tobacco and *Maintenance* refers to a state of regular, continued use (Werch and DiClemente, 1994). Otake and Shimai (2001) operationalised these definitions for their study on Japanese adolescents, and developed a questionnaire algorithm to discriminate between stages in individuals based on smoking intention and smoking rate. This is consistent with the TTM stages involving both intentional and behavioural criteria (Velicer, Prochaska, Fava, Norman and Redding, n.d.). Pre-Contemplation is defined as no intention to smoke now or in the future, Contemplation is the stage where no smoking has occurred but there is an intention to smoke in the future, Preparers have smoked within the past year and plan on smoking again within the next month, and those in the Action stage have smoked within the past 30 days (Otake and Shimai, 2001).

Interventions based on the TTM

One major advantage of using the TTM to design interventions is that the program can be made to address the issues faced by people in different stages (Prochaska, Johnson and Lee, 1998). To quote Maibach and Cotton (1995): “[The TTM] can serve as the basis for an effective audience segmentation analysis” (p. 43). As individuals in different stages are faced with different concerns, have different cognitions and are motivated to act by different influences (Prochaska et al., 1998), it stands to reason that an intervention designed for people at one particular stage should not be as effective for those in another stage. Prochaska et al. (1998) have, in fact, attributed the failure of many smoking interventions to the fact that they are aimed at people in the Action stage of cessation, whereas this group makes up only 20% of the smoking population. These authors emphasise the necessity of matching

interventions to the stage of change in which the recipients find themselves. This assertion extends to interventions aimed at the prevention of smoking acquisition. It is important to ensure that the programmes designed to prevent adolescents – a particularly vulnerable population – from smoking should be carefully informed and be targeting issues relevant to the subgroups in the adolescent population, whether these subgroups are formed on the basis of demographic or stage factors.

Conclusions

The above discussion has presented arguments in favour of using the TTM to understand adolescent smoking acquisition. As adolescence is established as a key period for the development of smoking (Marks, Murray, Evans and Willig, 2000), and a primary prevention strategy is preferable to secondary and tertiary treatment of illness (Pitts, 1996), there is a clear need for primary prevention interventions to target adolescents. The Transtheoretical Model is a widely used and empirically verified model for behaviour modification of problem behaviours (Prochaska, Johnson and Lee, 1998) and has successfully been applied to the design of interventions with primary prevention in mind, that is, has been applied to smoking acquisition (e.g. Werch and DiClemente, 1994). For these reasons, the TTM will be used in the present study to gather data along the dimensions proposed by the TTM: namely, Stage of Change, Decisional Balance and Temptation with the intention of using these data to inform the development of prevention intervention programmes.

However, there are other important factors in the uptake of smoking that are not dealt with directly by the TTM which need to be further discussed if a complete understanding of smoking acquisition is to be understood, and meaningful and effective interventions are to be

designed. Therefore, the following section will examine the correlates and hypothesised causes of smoking uptake and attempt to integrate them, where possible, within the TTM stages of change conceptualisation. Thereafter, current intervention strategies, based on these correlates and models of behaviour change, will be examined in order to illustrate the intellectual context in which current interventions are occurring.

Smoking: Causes and Correlates

Smoking has a complex ontogeny (Leventhal and Cleary, 1980) and its uptake, maintenance and cessation are influenced by a combination of biological, sociological, environmental and psychological factors (Conrad, Flay and Hill, 1992; Marks, Murray, Evans and Willig, 2000). These domains are interrelated and mutually influencing (Altman and Jackson, 1998) making the understanding of the underlying processes even more complicated. The challenge of designing effective preventative interventions thus lies in simultaneously addressing factors in numerous domains – while also determining which factors are best targeted to bring about the most efficacious results – through a variety of communication channels (Orlandi and Dalton, 1998).

This section will present a review of the literature associated with the correlates of smoking uptake. Owing to stage-based theoretical understandings of smoking uptake (such as the TTM), several studies have attempted to delineate the stage-specific influences of various factors and their relative contribution to smoking at different stages (e.g. Kassel, Stroud and Paronis, 2003; Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura, 2002; Mayhew, Flay and Mott, 2000) and these stage-specific influences will also be reviewed.

Understanding which factors are more important at each stage is a vital component of understanding the smoking acquisition process and designing effective interventions (Lloyd-Richardson et al., 2002; Mayhew et al., 2000). Influences on smoking behaviour can be divided into three domains: personal, social and environmental. While these dimensions are broad and oversimplify the complex and interacting nature of the factors influencing smoking acquisition, they nevertheless provide a useful framework for describing these phenomena in a coherent way and therefore shall be the basis of structuring the present review.

Personal variables

Research into smoking correlates and causation tended, in the early days, to focus on the fixed personal attributes of the individual smoker to explain differences in vulnerability. Later research, however, has focused increasingly on social and environmental factors (Altman and Jackson, 1998; Mayhew, Flay and Mott, 2000). Personal variables include those of biology, personality and psychology.

Biological Factors

A number of biological factors have been hypothesised to be associated with smoking uptake. Heath and Madden (1995, cited in Marks, Murray, Evans and Willig, 2000) have found predictive support from twin studies for a genetic component in smoking initiation and progression to long-term maintenance, and Kassel, Stroud and Paronis (2003) support the assertion of an innate sensitivity to nicotine. By this token, smoking behaviour is biologically determined. It is unlikely, however, that a genetic predisposition accounts for a direct pathway to smoking uptake when one considers the plethora of other socio-environmental

and psychological factors involved; genetic factors are likely to provide an underlying vulnerability in some individuals that may manifest itself under appropriate environmental conditions. Other biological factors include the addictive nature of nicotine (Kassel et al., 2003; Marks et al., 2003). Logically, the temporal sequence of smoking acquisition involves initial experimentation with cigarette smoking before nicotine dependence can occur (or at least exposure to environmental tobacco smoke); however, nicotine is deemed to be a highly addictive substance (Barlow and Durand, 2001) that develops dependence amongst users within a very short time period (Marks, Murray, Evans and Willig, 2000) and is thus a likely facilitator of the smoking acquisition process and the advancement to a later stage of smoking (Marks et al., 2000) after only a few initial tries.

Personality

As well as a genetic vulnerability to smoking, certain personality types may at risk more than others – and, indeed, genetic and personality factors are not entirely independent (Kassel, Stroud and Paronis, 2003). In their review of factors associated with smoking, Marks et al. (2000) suggested that Eysenck's (1960 in Marks et al., 2000) extraverted or sensation seeking personality is linked to increased smoking through the pathway of engaging in a risky behaviour in order to increase levels of cortical arousal. Similarly, Kassel et al. (2003) suggest that stable personality characteristics associated with higher levels of negative affect, such as neuroticism, extraversion and psychoticism are associated with a higher risk for smoking. Marks et al. (2000) also suggest hostility as a predisposing factor to smoking.

Other individual predisposing factors linked with smoking have been psychopathology (Kassel et al., 2003). Psychopathology may also have a high degree of genetic explanation,

thus providing another pathway for the action of genetic differences on smoking uptake (Kassel et al., 2003).

Despite the role of biological and personality factors in smoking uptake, far more research into smoking acquisition has focused on changeable psychosocial and environmental factors, rather than an individual's fixed biological or personality factors. This is possibly for two reasons: firstly, biological factors are unlikely to act directly on a person's smoking behaviour, but rather interact with the contextual factors (such as availability, peer group norms, etc.; Altman and Jackson, 1998). Secondly, smoking prevention interventions are unable to change the fixed biological characteristics of a person, thus making research into factors that can be changed far more useful in the context of intervention and policy design. With this in mind the discussion now turns to psychological factors associated with smoking.

Psychological Factors

There are a number of psychological states that are associated with smoking uptake and continued use of cigarettes. Among adolescents in early stages of smoking acquisition, curiosity (Marks, Murray, Evans and Willig, 2000; Plummer et al., 2001), boredom (Marks et al., 2000) and negative affect control (Pallonen, Prochaska, Velicer, Prokhorov and Smith, 1998; Prochaska, Johnson and Lee, 1998) are among the more salient psychological factors in smoking uptake.

One of the most researched and highly debated associations is between smoking and stress (Marks, Murray, Evans and Willig, 2000). One of the most common reason given by smokers for their smoking is its alleged anxiolytic properties – its properties of stress reduction (Marks

et al., 2000), which can take the form of regulating internal emotional states, producing positive emotional reactions, decreasing negative reactions, reducing social anxiety, and reducing general anxiety and tension (Leventhal and Cleary, 1980). In-depth qualitative studies on the functions of smoking have produced similar results suggesting that smoking functions as a means of coping with emotional and psychosocial stress (Marks et al., 2000; Seguire and Chalmers, 2000). What is generally agreed in the literature is that there is a reliable relationship between smoking and stress (e.g. Kassel, 2000; Kassel, 2003; Parrot, 1998; Parrot, 1999). What is debated, however, is the nature of the relationship between the two (Kassel, 2000) – in which direction does causality lie or, failing that, are there mediating or moderating factors affecting the relationship?

Parrott (1999) argues in favour of smoking causing stress and bases this assertion on several observations: firstly, that smokers appear to have higher levels of stress than non-smokers; secondly, within the smoking population, smoking is followed by a decrease in stress and that stress levels increase until another cigarette is smoked; thirdly, smoking initiation increases tonic negative affect in smokers and this decreases again upon maintained cessation. Parrott (1999) concludes that smoking does in fact cause stress, which highlights the paradoxical nature of smoker self-reports of smoking as relaxing. This paradox – which has been called the *nicotine paradox* (Marks, Murray, Evans and Willig, 2000) – is explained by Parrott (1999) who asserts that the feelings of relaxation reported by smokers is a result of the alleviation of symptoms of nicotine withdrawal syndrome [NWS²], and does not represent a genuine decrease in overall stress.

² NWS refers to the psychological and physiological symptoms resulting from the withdrawal of nicotine from a nicotine-dependent individual, and is characterised by stress, tension, anger, irritability and a craving for nicotine (Barlow and Durand, 2001; Parrott, 1998).

There are a number of objections to Parrott's (1999) conclusions, however. Kassel, Stroud and Paronis (2003), however, have argued that the self report of smokers does not constitute empirical grounds for concluding that smoking causes stress. Kassel (2000) questions the direction of the smoking-stress relationship, suggesting that some evidence even exists supporting an indirect pathway for smoking decreasing stress. These authors, while finding a clear association between stress and smoking across initiation and maintenance (Kassel et al., 2003), were unable to find a causal pathway, and suggested that transdisciplinary research taking into account all implicated factors is needed to determine the nature of the smoking-stress relationship. The empirical establishment of causality is, however, problematic. Piasecki and Baker (2000) have argued that establishing a causal link between smoking and stress is inherently limited by the impossibility of the ideal research design, suggesting that "what is really needed is information about what smokers' affective experiences would have been had they not become dependent smokers" (Piasecki and Baker, 2000, p.1157) – information that is impossible to obtain. Kassel et al. (2003) furthermore suggest that a valid means needs to be obtained for differentiating deprivation reversal (alleviating effects of NWS) and genuine affective enhancement.

While the direction of causality of stress and smoking is not yet clear, what is clear is a marked association between smoking and stress which has been shown to predict the transition from experimental to regular smoking (Kassel et al., 2003). A number of specific stressful situations are associated with smoking uptake: family stress is particularly important in uptake in young girls; household dysfunction and abuse are also salient stress-based risk factors (Kassel et al., 2003).

Higher levels of depression have been hypothesised to be associated with increased smoking, both in smoking acquisition (e.g. Brown, Lewinsohn, Seeley and Wagner, 1996; Covey, Glassman and Stetner, 1998; Tercyak, Goldman, Smith and Audrain, 2002) and in the cessation process (Covey et al., 1998; Hitsman, Borrelli, McChargue, Spring, and Niaura, 2003). With regards to smoking cessation, Hitsman et al. (2003) conducted a meta-analysis of the hypothesised depression-smoking association and found that a history of major depression does not predict smoking cessation or relapse, which contradicts many previous studies into this area, say the authors (e.g. Glassman, 1993, cited in Hitsman et al., 2003).

With regards to smoking uptake, on the other hand, depression has been shown to increase smoking and facilitates transitions from non-smoking to experimental smoking, and experimental to established smoking in individuals with peers who smoke (Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura, 2002; Mayhew, Flay and Mott, 2000). Tercyak et al. (2002), while not finding in favour of depression as a predictor of smoking on its own, found a significant interaction between depression and advertising receptivity in increased smoking. Taken together, these two findings suggest that depression may not in itself be a predictor of smoking, an assertion confirmed by recent prospective investigations into depression as a factor in smoking uptake (e.g. Goodman and Capitman, 2000, cited in Tercyak et al., 2002). Conversely, it may be true that smoking may cause depression (Tercyak et al., 2002). It is possible, however, based on the findings of Mayhew et al. (2000) and Tercyak et al. (2002), that depression may make adolescents more vulnerable to external cues to smoke (such as those coming from the peer group or tobacco advertising). This suggests that depression may be factor requiring consideration for a sub-group of adolescents in the design of prevention interventions as it may promote smoking under specific conditions.

Stress, anxiety and depression represent negative mood states often referred to generally as “negative affect” (Piasecki and Baker, 2000). Some authors seem to differentiate between these terms (e.g. Kassel, Stroud and Paronis, 2003), while for others research into negative affect incorporates all aspects of negative mood, including both stress and depression (e.g. Leventhal and Cleary, 1980; Prochaska, Johnson and Lee, 1998). Marks, Murray, Evans and Willig (2000) refer to negative affect generally – also incorporating pleasure and stimulation – as some of the primary motivating factors in smoking acquisition. It is important to note that negative affect – referring to all situations in which someone experiences negative mood – is one of the core tempting factors in Prochaska and DiClemente’s (1983) Transtheoretical Model. In keeping with the TTM conceptual framework, therefore, the present research project will adopt a meaning for “negative affect” to include all negative mood states.

Other substance use

Smoking is an addictive behaviour (Barlow and Durand, 2001) and shares a high comorbidity with a number of other substance uses and abuses (Miller and Gold, 1998). Lai, Lai, Page and McCoy (2000) have found that smokers are more likely than non-smokers to use other addictive substances, including crack, heroin, marijuana and cocaine. Of particular interest is the high association between smoking and alcohol use. Miller and Gold (1998) found that 80% of alcoholics in the USA smoked and 30% of smokers were alcoholics. Alcohol use has been shown to facilitate the transition from the non-smoker to experimental smoker stage of acquisition (Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura, 2002). In the South African context Flisher, Parry, Evans, Muller and Lombard (2003) confirmed this association between smoking and alcohol use among high-school students in Cape Town. In KwaZulu-Natal, Dlamini, Jinabhai, Kleinschmidt, Naidoo and Taylor (2003)

found that smoking cigarettes greatly increases the odds of other substance use among a sample of rural high-school pupils.

Age

Age has been positively associated with smoking in a number of studies. Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura (2002) have found that a higher school grade is more likely to differentiate regular from experimental smokers in a very large sample of adolescents ($n > 20\,000$). Similar results were found in a four-year longitudinal study of 12-18 year olds, where an older individual at baseline was twice as likely to have progressed from the experimental to established stage of smoking after a four year period (Choi, Pierce, Gilpin, Farkas and Berry, 1997). Bruvold (1993) found age to be a mediating variable of smoking prevention program efficacy in a meta-analytic study where higher school grade was positively associated with smoking prevalence. The association between age and smoking prevalence in adolescents has been confirmed in the South African literature (e.g. Flisher et al., 2003; Madu and Matla, 2003).

Ethnicity

Studies conducted in the USA have concluded that Whites have a higher prevalence of smoking than African Americans (Marks, Murray, Evans and Willig, 2000). Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura (2002), in their study of stage-specific influences on smoking acquisition, suggested that African American ethnicity was a protective factor against smoking uptake, and was protective in transitions from both non-smoking to experimental smoking, and experimental to regular smoking. The pattern of

smoking differences by ethnicity in the South African context is similar but not identical. Far lower rates of smoking (and other substance use) occur among black females, but not black males (Flisher, Parry, Evans, Muller and Lombard, 2003). Black males show comparable rates of smoking to whites and coloureds (Flisher et al., 2003).

Gender

Smoking patterns among men and women have historically been, and are currently, different (Marks, Murray, Evans and Willig, 2000). During most of the 20th century, smoking was a male prerogative (Marks et al., 2000). However, since the early 1990s there have been an increasing number of young female smokers (Seguire and Chalmers, 2000). It is unlikely that this gender difference is based on innate individual characteristics so much as varying social conditions, such as the social functions of smoking (Seguire and Chalmers, 2000) and the social acceptability of female smoking, which is linked to female empowerment in the Western world (Boyd, Boyd and Greenlee, 2003). Gender differences will thus be discussed in the following section dealing with social factors influencing smoking uptake.

Social Factors in Smoking Uptake

Leventhal and Cleary (1980) suggest that social pressure is the single most important indicator of beginning smoking. Subsequent researchers have come to similar conclusions: social factors such as peer smoking (Schofield, Pattison, Hill and Borland, 2001), peer pressure (Altman and Jackson, 1998), family smoking (Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura, 2002) and normative beliefs about smoking (Schofield et al., 2001) have been found to have substantial influence on the uptake of smoking. This evidence

contextualises smoking as a social activity (Marks, Murray, Evans and Willig, 2000) and has inspired studies to examine the social function smoking performs in the lives of smokers (Marks et al., 2000; Seguire and Chalmers, 2000). It is thus important to consider the social context and its influence on individual predispositions to smoke and the decision-making process involved in smoking uptake.

The Family

There is a large body of research associating aspects of the family context with smoking uptake (Bauman, Foshee, Ennett, Hicks and Pemberton, 2001). The family is an important institution of primary socialisation for an individual, and represents a significant source of children's and adolescents' learning of the normative beliefs and values about smoking, as well as providing them with the access and skills necessary to smoking cigarettes (Altman and Jackson, 1998). Unstable family life can be a risk factor for smoking (Conrad, Flay and Hill, 1992; Kassel, Stroud and Paronis, 2003). For example, in a longitudinal study, Kirby (2002) and Tucker, Ellickson and Klein (2003) found that parental separation increases the likelihood of smoking. It was suggested that parental separation increases smoking by increasing the psychological distress, depression and rebelliousness of the adolescent and decreasing their self-esteem (Kirby, 2002). Similarly, abuse by a parent has also been associated with an increased risk for smoking (Kassel et al., 2003).

Aspects of the child-parent relationship can also have an effect on the likelihood of adolescent smoking. A close parental relationship, for example, has been shown to be a protective factor against smoking, especially one characterised by a high degree of parental control over the adolescent's behaviour (Altman and Jackson, 1998). Conversely, low levels

of parental support are reportedly a risk factor for the transition from experimental to regular smoking (Tucker, Ellickson and Klein, 2003). Despite common conceptions that adolescents routinely disregard parental advice and instructions, evidence exists that adolescents are more likely to legitimise parental authority regarding tobacco and other substance use than they are other issues (Jackson, 2002). This suggests that parents can and do play an important role in protecting (or endangering) their children with regards to smoking. The role of parents extends to their degree of concern about their adolescent's future smoking, the degree and quality of communication about problems (Distefan, Gilpin, Choi and Pierce, 1998), and communication about the consequences of breaking family rules about smoking (Komro, McCarty, Forster, Blaine and Chen 2003). Some evidence exists supporting certain parenting styles as protective against adolescent smoking – particularly the authoritative parenting style, which is characterised by responsiveness and demandingness (Distefan, 2002), which was found to be a protective factor in the transition from never-smoking to experimentation in a two year longitudinal study of young adolescents (Distefan, 2002). Other authors, however, suggest that additional research needs to investigate the influences of parenting styles on smoking uptake (Jackson, 2002).

Parents have huge influence on the formation of normative behaviours surrounding smoking, especially early in childhood, through the processes of social modelling and socialisation (Altman and Jackson, 1998; Marks, Murray, Evans and Willig, 2000). Parental use of tobacco is thus a significant predictor of adolescent smoking. Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura (2002) found that parental smoking increased the likelihood of adolescent smoking progression by 26% from never-smoking to experimentation, and from experimentation to established smoking. Maternal smoking, and degree of mother-daughter connectedness (Faucher, 2002), seem to play a role of particular significance for girls, with a

smoking mother increasing the likelihood of a daughter's progression to a later stage of smoking by 36% (Lloyd-Richardson et al., 2002).

Just as parents can model negative smoking behaviour for adolescents and children, their behaviour can also promote positive health behaviour. For example, parental smoking cessation was found to increase the likelihood of adolescent cessation twofold, and reduced adolescent non-smokers' likelihood of smoking by a third, with greater effectiveness if parental cessation occurs before the child's ninth birthday (Farkas, Distefan, Choi, Gilpin and Pierce, 1999). Chassin, Presson and Sherman (2003) suggest the importance of parental cessation interventions because of the so-called "ripple effect" parental cessation seems to have on adolescent cessation. Their conclusions are based on a study by Bricker et al. (2003, cited in Chassin et al., 2003) which, like the study of Farkas et al. (1999), found that parental cessation reduces adolescent smoking by 25% if one parent quits smoking, and 39% if both parents are quitters. Chassin, Presson, Rose, Sherman and Prost (2002), however, stressed that both parents need to quit smoking to have a substantial effect on their children's smoking, as the impact of one parent's cessation is greatly reduced if the other parent (especially the mother) continues to smoke.

In conclusion, it is clear that the role of the family is important in laying the foundations for later smoking behaviour. It is not only parental influences that promote or prevent smoking, however; in a study controlling for parental smoking, Rajan et al. (2003) found that the smoking practices of older siblings significantly changed the odds of younger children's later smoking too.

Peers

While the family is important in the primary socialisation processes that influence early perceptions and attitudes towards smoking, the peer group builds on these attitudes and norms and is associated strongly with actual experimentation with cigarettes (Marks, Murray, Evans and Willig, 2000). The peer influence in smoking uptake has been established through a number of longitudinal and cross-sectional studies (Alexander, Piazza, Mekos and Valente, 2001).

Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura (2002) report evidence testifying to this very strong relationship: having one peer who smokes increases an adolescent's odds of ever-smoking 2.49 times. Having three or more smoking peers increases the odds of smoking almost nine times. The relationship is even stronger in the transition from experimental or intermittent smoking to regular, established smoking. Having three or more smoking peers makes an individual 70 times more likely to progress to regular smoking (Lloyd-Richardson et al., 2002). Furthermore, peer smoking was found in one study to accelerate this progression (Blitstein, Robinson, Murray, Klesges and Zbikowski, 2003). Similarly, Pallonen, Prochaska, Velicer, Prokhorov and Smith (1998) found that peer smoking accounted for most of the difference between the three acquisition stages of the TTM. These findings are also consistent with the assertion of Marks et al. (2000) that the influence of peers increases with later stages of smoking.

The relationship between smoking acquisition and peer smoking has been replicated in other studies, but not to the extent of Lloyd-Richardson et al. (2002). Alexander et al. (2001), for example, found that having a best friend who smoked increased the likelihood of smoking

twofold and also reported that this likelihood increased with a higher smoking prevalence at school. A similar result was found in another study where best friend smoking predicted progression from never-smoking to experimentation (Distefan, Gilpin, Choi and Pierce, 1998). The transition to regular smoking was also predicted by peer smoking (Tucker, Ellickson and Klein, 2003). The association of peer smoking with smoking initiation was also implied by the finding that, of those students caught smoking at school, 50% reported that all five of their closest friends were smokers (Riedel, Robinson, Klesges and McLain-Allen, 2002). This illustrates the very strong influence the peer group has on smoking acquisition, especially progression to regular smoking. Moderating the effect of peer influence should therefore be a major goal for preventative interventions.

The School

The school is a physical space in which much of adolescents' time is spent, and is thus an important area of adolescent socialisation and has been shown in this regard to have an influence on adolescent smoking acquisition (Alexander, Piazza, Mekos and Valente, 2001; Denman, Moon, Parsons and Stears, 2002). Policies and practices of the school can effect both the establishment of experimental and regular smoking (Nonnemaker, 2002). As well as policy, the adolescent's relationship to the school is also a significant factor in smoking. A lower level of school connectedness was found to be associated with a higher risk of smoking (Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura, 2002), with lower levels of connectedness being associated with stage transitions from non-smoking to experimental smoking, and experimental to regular smoking (Lloyd-Richardson et al., 2002) and with regular smoking independent of experimental smoking (Aveyard, Markham, Almond, Lancashire and Cheng, 2003). Additionally, a higher school prevalence has been associated

with an increased risk of smoking initiation among non-smokers (Alexander, Piazza, Mekos and Valente, 2001). Finally, lower academic orientation has also been associated with the transition to regular smoking (Tucker, Ellickson and Klein, 2003).

Perceived Social Norms

As alluded to above, the perception of the social norms around smoking are influential in smoking uptake (Chassin et al., 1984, cited in Marks, Murray, Evans and Willig, 2000). This assertion is also supported by research done in Cape Town on grade 8 and 11 students (King et al., 2003). Children and adolescents learn social norms from a variety of sources, such as the family, the peer group and mass media advertising, including that of the tobacco industry (Altman and Jackson, 1998).

Pallonen, Prochaska, Velicer, Prokhorov and Smith (1998) have suggested that the influence of the peer group is most important and Alexander et al. (2001) found that a higher number of popular students who smoked was related to prevalence of school smoking, which suggests that perceptions of favourable peer norms around smoking are influential in smoking uptake. Furthermore, there is evidence that smokers tend to have more smoking friends (e.g. Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura, 2002) and that peer group members tend to share similar smoking habits. This suggests that the perception of group norms is important in adolescent smoking.

This is not a new idea. The Theory of Planned Behaviour (Fishbein and Ajzen, 1975, cited in Pitts, 1998) argues that perceptions of the social norm – that is, beliefs a person holds about what his/her peer group values in terms of smoking behaviour – as one of its key

determinants of behaviour. The premise of this theory is that an intention to perform a behaviour is the “product of the expectation that important others will consider the performance of behaviour important and the value of the person’s approval” (Marteau, 1989, p. 4). The extent to which adolescents perceive smoking prevalence therefore affects their own smoking practices – a fact made more worrying due to adolescents’ tendencies to overestimate the prevalence of peer smoking behaviour (Kandel, 1996, as cited in Alexander et al., 2001).

Schofield, Pattison, Hill and Borland (2001) further compound the notion of the influence of peer norms on smoking by suggesting that peer norms are not an external force imposing themselves on an individual in conflict with that person’s personal attitudes and beliefs – as the TPB suggests – but are, in fact, a voluntary assimilation of normative beliefs into the individual’s identity. Smoking is not coerced through peer pressure, but is an action taken in order to define one’s identity. Research has suggested that people ascribe certain values and an “image” to smoker groups (Leventhal and Cleary, 1980) and that individuals may start smoking in order to define themselves as having a similar image and belonging to a certain group (Schofield et al., 2001). In other words, an individual’s behaviour occurring as a result of normative peer influence represents conformity to a shared “stereotypical” identity (Schofield et al., 2001, p. 2). What is yet unknown, however, is whether peer group norms dictate beliefs and values to the individual or the individual selects a peer group with group norms similar to the normative beliefs already held by the individual or normative beliefs that the individual values – the influence model and selection model, respectively (Schofield et al., 2001). Comparisons of these models have suggested that both the influence and selection model play a role in the adoption of peer group smoking norms (Engels et al., 1997, cited in Schofield et al., 2001).

Alexander, Piazza, Mekos and Valente (2001) also question the causal role of normative beliefs on smoking in the school context. These authors found that the smoking behaviour of popular students in a school was positively associated with pro-smoking school norms. This begs the question as to whether popular students are creators of the social norms to which other students aspire, or are the popular students becoming popular through conforming to prevailing social norms? It is likely that the answer is one of mutual influence – as is the case in the Schofield et al. (2001) study.

The implications for preventative interventions are that the positive stereotypical group values and images of smoking must be undermined, and adolescents must be provided with alternative, health-promoting values.

As well as peer social norms influencing adolescent smoking acquisition, other influences are also known to shape adolescent smoking norms, for example, the family (Altman and Jackson, 1998), the school (Alexander, Piazza, Mekos and Valente, 2001), popular cinema (Dalton et al., 2003), and tobacco industry marketing (Altman and Jackson, 1998). The influences of the family and school have been discussed in the previous section, and the role of mass media will be discussed in the following section about the environmental influences of smoking.

What is clear from the above evidence is that social values governing smoking and adolescents' perceptions of them play a vital role in the acquisition of smoking. One of the major criticisms of the TTM is that it does not focus sufficiently on social factors in the process of behaviour change (Marks et al., 2000). It is for this reason that the present study proposes to incorporate a measure of Perceived Social Norms with the TTM constructs of

Decisional Balance and Temptation in order to obtain a more complete understanding of adolescent smoking.

Social Differences due to Gender

As mentioned previously, the prevalence of smoking has historically been characterised by a gender difference, where men tended to smoke more than women (Marks, Murray, Evans and Willig, 2000), but this gender difference has decreased due an increase in incidence of young female smokers since the 1990s (Marks et al., 2000); in fact this increase in prevalence has occurred at such an alarming rate that it is projected that without intervention smoking rates among women will triple over the next generation (Andrews and Heath, 2003). However, Tercyak, Goldman, Smith and Audrain (2002) nevertheless report findings that suggest being male represents a higher risk factor for ever-smoking. It seems that while the prevalence of male and female smoking seems similar, the incidence among females is far greater and they represent a more vulnerable population.

A notably significant gender difference exists between black boys and black girls in Cape Town, however (Flisher, Parry, Evans, Muller and Lombard, 2003), with the prevalence rates for girls almost four times lower than boys in grade 8 and ten times lower in grade 11. Other race groups in this study, however, showed statistically non-significant differences between boys and girls, although the prevalence rates for girls were slightly higher (Flisher et al., 2003). This marked gender difference among black adolescents suggests that black girls may become a future target for tobacco industry marketing, especially in light of the recent trend of tobacco industry marketing to women in developing countries (Andrews and Heath, 2003). As Flisher et al. (2003) suggest, therefore, factors preventing this population need to be

determined and used to inform interventions to ensure that they remain predominantly non-smoking.

While, historically, being a woman seemed to be a protective factor against smoking, this is no longer the case. These changes reflect a changing social climate in which women, especially in the Western world, are moving into a formerly male-dominated world, where smoking is a symbol of independence and female achievement (Boyd, Boyd and Greenlee, 2003). Furthermore, one of nicotine's physiological properties is that it acts as an appetite suppressant and the pervasive media promotion of female slimness as desirable has increased female smoking as a means of weight control (Boyd, Boyd and Greenlee, 2003; Marks et al., 2000).

The social meanings of smoking thus differ for males and females. Girls tend to smoke as a sign of sophistication, popularity and to promote an image of high self-esteem, on one hand, or feel coerced into smoking by girls higher up the pecking order as a result of their low self-esteem and poor social skills (Michell and Amos, 1997). These authors argue that these findings suggest that smoking is not promoted by low self-esteem, as is frequently presumed by smoking theories. Rather, the girls who were more popular in the high-school hierarchy were more likely to smoke. Boys, on the other hand, are less likely to smoke (in contrast to findings by Tercyak et al., 2002) as smoking negative impact on fitness and performance in sport was to some degree protective (Michell and Amos, 1997). It would seem, therefore, that social meanings around smoking seem to protect boys.

In commenting on this study, however, Marks et al. (2000) warn that the findings must be interpreted within the social context in which they occurred and may not represent a

generalisable pattern of smoking in all adolescents. The sample used in the Michell and Amos (1997) study was drawn from a lower working class population in Glasgow and therefore Marks et al. (2000) suggest that this pattern of gender differences may only occur among working class people. Marks et al. (2000) cite other studies that report that female smoking in adolescence may represent a rebellion of traditional expectations and norms around femininity and the “good girl” image (Wearing et al., 1994, as cited in Marks et al., 2000, p. 189). This view supports the position of Boyd et al. (2003) that female smoking may represent female achievement in a male-dominated world.

The Social Meanings of Smoking

As mentioned above, and illustrated by the above review of evidence, smoking does not occur in a social void. Smoking serves a number of social functions, and the meanings given to smoking behaviour are likely to have a profound influence on an adolescent’s initiation into smoking (Marks, Murray, Evans and Willig, 2000). The social climate in which smoking occurs has produced increasingly ambiguous discourses about smoking since the 1960s (Parrott, 1998). While smoking was seen as a normal part of adult life earlier in the 20th century and adolescents began smoking as a rite of passage into adulthood, increased knowledge of the dangers of smoking and health promotion messages have created an environment where smoking is seen as tantamount to drug abuse (Parrott, 1998). The social climate in which smoking occurs thus promotes ambiguous messages, from tobacco marketing on one hand and health promotion media on the other (Orlandi and Dalton, 1998). This highlights the importance of the social context as a factor that can either be protective or endangering to adolescents with regards to smoking messages. How adolescents perceive

smoking and the how it functions for them socially thus becomes critical in understanding the processes involved in smoking acquisition.

Studies conducted with English adolescents have suggested that smoking functions as a means for teenagers to assert their adult identity and provides a means for defining themselves as group members and reaffirming these social relationships, as well as alleviating boredom (Murray et al., 1983, cited in Marks et al., 2000). Leventhal and Cleary (1980) suggest that two separate functions of smoking may exist for adolescents: the first involves defining the self as cool, tough and independent of adult authority; and the second involves seeking social approval from peers. Whatever the function smoking performs for an individual, however, what is clear is that smoking acts as a means of social bonding through a shared activity (Seguire and Chalmers, 2000; Marks et al., 2000) and functions as a symbol of adult identity (Seguire and Chalmers, 2000; Marks et al., 2000) or a social crutch (Seguire and Chalmers, 2000). Schofield, Pattison, Hill and Borland (2001) have expanded the idea of smoking as a symbol of adult identity by suggesting that an adolescent may smoke to obtain group membership of any group that has (for him/her) a valued group identity. Thus adolescents may smoke in order to define themselves as “the rebels”, “the motorcyclists”, “the skaters”, “the troublemakers”, and so on (Schofield et al., 2001).

Environmental Factors in Smoking Uptake

The environmental domain includes factors such as government policies, laws and taxes on tobacco, and also similar factors such as those originating from the mass media, community, school or workplace, such as workplace smoking bans or school punishment. Altman and Jackson (1998) are strong proponents of the Ecological Model (discussed previously) and

systems theory, both of which are concerned with the effects of environmental factors as they impact on individual and social smoking practices. These authors argue that the failure of most preventative interventions can be attributed to the host of pro-smoking messages available to adolescents – which are not countered by these interventions – and give, as examples, tobacco marketing, lack of enforcement of tobacco laws, easy accessibility of cigarettes to name a few (Altman and Jackson, 1998). The following section deals with environmental factors that are associated with smoking initiation.

Advertising

One of the most significant factors associated with smoking is tobacco industry marketing (Altman and Jackson, 1998; Distefan, 2002; Hastings, MacFadyen and Eadie, 1999; Hu, 1998). As Hastings et al. (1999) state: “The tobacco industry is to lung cancer what the mosquito is to malaria” (*web page*). In a world with mounting anti-smoking sentiment and promotion of the health-risks of tobacco use, the tobacco industry is the disease vector that drives the smoking epidemic (Hastings et al., 1999). To give some indication of how effective the tobacco industry believes marketing to be, their 2001 expenditure on advertising and promotions in the USA alone was US\$ 11.2 billion (Schroeder, 2004).

Smoking advertising functions through the creation of an accepting social environment in which non-smokers are encouraged to begin smoking and existing smokers are discouraged from quitting (Altman and Jackson, 1998; Ling and Galantz, 2002a). This is achieved by integrating smoking into the lives of adolescents and smokers – in the activities they perform and the places they frequent – thereby associating smoking with going to the pub, leaving home, going away to university, and so on (Ling and Galantz, 2002b). Tobacco marketing

includes many activities including advertising, promotion and sponsorship of events, giving away promotional items, and the distribution and packaging of tobacco products (Altman and Jackson, 1998; Harper and Martin, 2002).

Warner et al. (1992) describe both direct and indirect mechanisms of tobacco marketing effectiveness, the later of which has better empirical support, although support for the former is nonetheless substantial (Altman and Jackson, 1998). The direct marketing mechanisms include increasing consumption and reducing the resolve to quit while promoting relapse. Indirect mechanisms include the creation of an accepting and normative environment for smoking, and using the tobacco industries considerable political power to suppress anti-smoking policy and promotion (Warner et al., 1992). Tobacco marketing also uses the portrayal of healthy smokers in its adverts in order to suppress health-risk perceptions of smoking (Romer and Jamieson, 2001).

There is a large body of supporting evidence linking tobacco industry marketing with smoking (e.g. FDA, 1995, cited in Altman and Jackson, 1998). Tobacco marketing has been found to have a marked effect on adolescents, despite the tobacco industry's claims that their marketing is aimed at adults and existing smokers (Altman and Jackson, 1998). The Joe Camel cartoon slogan was readily recognised by 88% of 10-19 year olds (Hu, 1998) and the youth market for Camel cigarettes increased more than 9% following the introduction of Joe Camel (Altman and Jackson, 1998). Furthermore, most children under six years of age could successfully match a picture of Joe Camel to cigarettes (the same rate of success was achieved with Mickey Mouse and Disney World) (Fischer et al., 1991, as cited in Altman and Jackson, 1998) and 80% of 12-13 year old children were aware of the claimed stress-relief benefits of smoking (Evans et al., 1995, as cited in Altman and Jackson, 1998).

With regards to smoking initiation, receptivity to tobacco advertising (defined as the product of attitudes to smoking and recognition of adverts and slogans) has been found to increase susceptibility to smoking (defined as thoughts of potential or future smoking) (Hu, 1998). A fourth quartile receptivity score is associated with an increased smoking susceptibility of 7.54 times (Hu, 1998). In support of the findings of Hu (1998), Pierce, Choi, Gilpin, Farkas and Berry (1998) reported findings of a significant association between baseline smoking advertising receptivity and subsequent progression towards smoking in a three-year longitudinal study of baseline non-susceptible non-smokers. Advertisement receptivity has also been associated with ever-smoking (Tercyak, Goldman, Smith and Audrain, 2002) and with a higher uptake of cigarettes in a 21 month longitudinal study of 4th to 11th grade students (Sargent et al., 2000).

Growing concern about the economic and health costs of tobacco use have resulted in increasing pressure on governments to provide legislation restricting the trade and marketing allowed by the tobacco industry (Gilmore and McKee, 2002; UNF, n.d.). However, these restrictions have proven problematic as they are in conflict with free-trade laws; as a result governments have the difficult task of balancing economic with public health demands (Gilmore and McKee, 2002). However, despite the difficult legal and practical issues surrounding implementing international tobacco restriction policies, the United Nations [UN] and World Health Organisation [WHO] have set up a number of policy interventions that have restricted advertising and promotion of tobacco products (for example, the Framework Convention for Tobacco Control [FCTC] and the Tobacco Free Initiative; UNF, n.d.). The FCTC involves an international agreement between countries to implement restrictive tobacco policies such as taxation, access to minors and advertising with the goal of reducing the prevalence of tobacco use (WHO, 2003).

Against this increasingly unfriendly background, the tobacco industry has had to devise additional marketing strategies, circumventing opposing legislation, to promote tobacco to adolescents who will act as the replacements for the 400 000 smokers who die each year (Altman and Jackson, 1998). Some of these marketing strategies include advertising in films (Distefan, Gilpin, Sargent and Pierce, 1999; Harper and Martin, 2002), hosting parties and promoting events, and advertising at nightclubs and through the internet and e-mail (Harper and Martin, 2002).

A number of “prevention programs” designed by the tobacco industry have recently emerged, which have been examined by health promotion professionals with some degree of scepticism (e.g. Sussman, 2002). Landman, Ling and Galantz (2002) reviewed tobacco industry documents about these prevention programs and reported that they were implemented by the tobacco industry as means of forestalling restrictive advertising legislature. Furthermore, these prevention campaigns actually help with tobacco industry marketing as they promote smoking as a free adult choice which helps fight public smoking bans and marketing restrictions (Landman et al., 2002) and allow a legitimate avenue for the tobacco industry to advertise in the mass media. These prevention programs are furthermore of no benefit to the anti-smoking lobby as they were shown, in a review by Sussman (2002), to lack the components essential to effective health promotion campaigns. Other alternative marketing strategies have included the marketing of “low tar” or “light” cigarette brands, which Gilpin, Emery, White and Pierce (2002) report function to encourage procrastination to quit among smokers, while offering them no genuine reduction in health risk (Gilmore and McKee, 2002).

The tobacco industry, therefore, by both direct and indirect marketing methods (Warner et al., 1992), is responsible for driving the tobacco pandemic. Interventions are needed at all levels from the individual to macro-political in order to dilute the influence of tobacco industry marketing (Altman and Jackson, 1998; Orlandi and Dalton, 1998). A number of strategies in this regard will be discussed in the section on interventions.

Conclusions

The above review has dealt with the various individual, social and environmental factors associated with smoking uptake. Due to the complex and interrelated nature of these factors, preventive interventions need to consider multiple factors and address smoking at more than one level for any meaningful health promotion gains to be made (Orlandi and Dalton, 1998). The following section reviews past strategies adopted by health promotion professionals in order to provide the rationale for conducting research to inform a school-based intervention.

Intervention Strategies for Smoking Prevention

Smoking prevention interventions may be grouped along a number of dimensions, such as the type of influence they attempt to exert (informational, affective, social, and so on), their theoretical underpinnings (such as the TTM or SCT), and the channel in which they are delivered (the environment, the school, through policy, etc.). Furthermore, while the field of health promotion is unified in its overall goal to reduce the harm caused by substance use in general – including smoking – there are debates as to whether the best pathway to this goal is through reducing the *number* users or through focusing on reducing the *harm* caused by the

use of the substance (MacCoun, 1998). While smoking interventions have had an impact on the overall reduction in smoking prevalence worldwide, the growing incidence of adolescent smokers and substantial burden smoking puts on health care systems indicates that additional research is needed to design more effective interventions (UNF, n.d.). While an exhaustive review of all intervention strategies is not relevant to this study, two findings are of particular interest.

The School as an Important Intervention Site

The school also is a significant source of potentially harmful smoking practices. As already discussed, the school is an important site of socialisation and peer group interaction which has significant impact on smoking uptake (Altman and Jackson, 1998). However, the school environment as determined by policies on teacher and pupil smoking also affects the smoking practices of students. A global, well-enforced school policy regulating smoking has been shown to reduce adolescent smoking (Alexander, Piazza, Mekos and Valente, 2001; Denman, Moon, Parsons and Stears, 2002; Griesbach, Inchley and Currie, 2002). The role of policy in regulating smoking in schools is stressed by the WHO (1993, as cited in Denman, Moon, Parsons and Stears, 2002) who state the importance of the “Health Promoting School” – a school in which healthy lifestyle choices are promoted and individuals are empowered take control of their health through education and skills training. Through an extensive review of studies investigating the Health Promoting School, Denman et al. (2002) found that the need for clear, detailed and well-implemented school policies was paramount.

Three reasons motivate the school as an appropriate site for preventative interventions: firstly, the school offers a convenient site to deliver intervention programmes that will reach the vast majority of adolescents; secondly, the school has been found to be a significant site

of socialisation for smoking (Alexander, Piazza, Mekos and Valente, 2001) and anti-smoking socialisation in this location would provide an alternative to the pro-smoking norms advocated in schools; and thirdly, the role of the school as an educational institution lends itself well to the provision of health-promoting curricula (CDC, 1999; Denman et al., 2002).

These findings motivate the school as an important site for smoking research and interventions. Accordingly a large number of preventative interventions have been delivered through the school, some of which have been more successful than others.

Varying Effectiveness of School Interventions

In a meta-analysis of school smoking prevention programmes Bruvold (1993) found that four main orientations have been used in designing adolescent smoking prevention interventions: rational, developmental, social-normative, and social reinforcement. The rational or informational approach was the traditional means of intervention and involved providing factual information about the consequences of smoking (Bruvold, 1993). One clear finding in behaviour change research is that providing people with information about behavioural health risks is necessary, but certainly not sufficient to cause change (Bruvold, 1993; Maibach and Cotton, 1995; Orlandi and Dalton, 1998). The second type of prevention programme, the developmental approach, involves affective education, enhancing self-esteem, interpersonal skills, and decision-making skills to aid individuals in making better-informed decisions about smoking. Bruvold (1993) found this approach to be more successful than the informational, but not as effective as the social approaches – the third kind of preventive intervention. Health promoters tend to use either of two socially-based approaches – the social norms approach or the social reinforcement approach. The former addresses pro-

smoking normative beliefs and provides alternative norms, while the latter involves skills to recognise and resist social pressure to smoke and to identify social consequences of smoking (Bruvold, 1993).

The results of this meta-analysis show that all the above approaches produce equal gains in knowledge, but only the social norms and social reinforcement approaches consistently produce significant reductions in smoking. A later meta-analysis conducted by Rooney and Murray (1996) supported the findings of Bruvold (1993) and suggested that understanding perceptions of the social norms of smoking and addressing these perceptions are paramount in smoking prevention programmes. However, Rooney and Murray (1996) suggest that effect sizes for existing interventions are very small and offer no more than a 5% reduction in adolescent smoking. This illustrates a need for additional research to be conducted into adolescent smoking to better inform prevention programmes (Rooney and Murray, 1996).

These two findings taken together suggest that research informing smoking prevention interventions would benefit from having a school-based focus, and should aim to create prevention programmes with a social norms and social reinforcement approach.

AIMS AND RATIONALE

The TTM (Prochaska and DiClemente, 1983) has been established as one of the most influential and effective models in changing behaviour (Marks, Murray, Evans and Willig, 2000) and has been shown to be applicable to adolescents (Aveyard, Lancashire, Almond and Cheng, 2002) and the smoking acquisition process (Otake and Shimai, 2001; Pallonen, Prochaska, Velicer, Prokhorov and Smith, 1998; Werch and DiClemente, 1994). The major advantage of the TTM in behaviour change is that the stage conceptualisation allows interventions to match the stage of readiness to change of the individual, making interventions more effective (Prochaska, Johnson and Lee, 1998). However, the TTM has enjoyed very little application to adolescent smoking acquisition in the South African context, despite the need for its validation by cross-cultural application (Otake and Shimai, 2001). Only one study (Flisher, Parry, Muller and Lombard, 2002) has used the stage construct in a study of adolescent substance use in Cape Town. This may be because prior South African research has tended to focus on the correlates of adolescent smoking rather than the processes involved in smoking acquisition (e.g. Flisher, Parry, Evans, Muller and Lombard, 2003).

An extensive review of the literature on the causes and correlates of smoking has shown that the normative influence of peers especially, and the mass media and family, are powerful agents of socialisation into the practice of smoking. Adolescents' perceptions of the social norms of smoking are therefore a significant factor in the uptake of smoking (Chassin et al., 1984, cited in Marks, Murray, Evans and Willig, 2000). The TTM however, does not include a satisfactory measure of this very important predictor of smoking initiation (Marks et al., 2000). The TPB however includes perceptions of the social norm as one of the key predictors

of behavioural intention (Pitts, 1998). As discussed above, the TTM and TPB are well suited to be theoretically integrated (Holtgrave, Tinsley and Kay, 1995) and, aside from the social norms variable and stages of change variable, are very similar theories: both the TTM and TPB are based on decision-making (Holtgrave et al., 1995; Velicer, Prochaska, Fava, Norman and Redding, n.d.) and both view behaviour as highly contingent on intention (Pitts, 1998; Velicer et al., n.d.).

The review of core findings from evaluations of smoking prevention interventions and their relative lack of efficacy in reducing smoking incidence (Rooney and Murray, 1996) indicates that additional research is needed to inform improved interventions. This review also supports the use of the school as a useful site for preventative interventions to be implemented.

The overarching aim of this study, therefore, is investigate the process of adolescent smoking acquisition using the Transtheoretical *stage of smoking* model. The application of the TTM to different populations in the context of smoking acquisition has been recommended to empirically validate the theoretical basis for the TTM in smoking acquisition (Otake and Shimai, 2001) and to establish the pattern of changes in pros and cons across stages, as has been done for smoking cessation and a variety of other health behaviours (Prochaska, Johnson and Lee, 1998). As the TTM does not include a measure of the effect of social norms on smoking acquisition, a measure of perceived social norms will be incorporated into the design, given the well-established importance of the normative environment in smoking. This will have theoretical implications for a link between the TTM and another important health behaviour model – the Theory of Planned Behaviour (Fishbein and Ajzen, 1975, cited in Pitts, 1996).

This overarching aim of applying the TTM in the South African context as stated above will entail a set of smaller research aims:

Firstly, this study aims to investigate the relationship between the TTM constructs of Stage of Acquisition, Decisional Balance and Temptation in a South African adolescent population. This will entail determining the unique decisional balance and temptation patterns of change across stages – that is how the measures of Decisional Balance and Temptation vary across stages. Further investigations into possible sub-divisions of the Decisional Balance and Temptation constructs will also occur (such as investigating the validity of the Social Pros sub-division of the Pros of smoking construct; Plummer et al., 2001). These findings will have both theoretical and practical implications, as they will determine how South African adolescents perceive the pros and cons of smoking, and what tempts them to smoke, at each stage, thus broadening the scope of TTM application. These findings, in turn, will inform stage-matched smoking prevention interventions.

Secondly, this study aims to investigate the relationship between Stage of Acquisition and demographic variables: gender, language background, religious beliefs, school and grade. These findings will be useful as there is a paucity of smoking prevalence data for urban adolescents in KwaZulu-Natal, and stage-prevalence is a far more detailed indicator of smoking than is a mere prevalence rate. Furthermore, the patterns of stage-membership for different demographic groups will inform the stage-matched prevention interventions, as suggested by Werch and DiClemente (1994).

Thirdly, other associations with acquisition stage will be investigated, such as parental smoking, perceived social norms, perceived adult prevalence, self-rated level of religious

conviction, and amount of alcohol consumed per week, as these variables have been shown to be positively associated with adolescent smoking onset³.

Fourthly, this study will investigate demographic differences along the variables of Decisional Balance, Temptation and Perceived Social Norms, as this will give an indication of differences in attitudes towards and beliefs about smoking among various demographic groups. This knowledge is essential in designing effective interventions that suit the recipient group's particular beliefs about smoking. If, for arbitrary example, boys tended to motivate their decision to smoke based on perceived social benefits more than girls did, it would be useful to tailor prevention interventions aimed at boys with strategies to undermine these perceptions.

The findings of this study will be used to create a demographic profile of South African adolescents' smoking patterns – giving detailed information about which variables are salient for particular demographic groups and particular stages – thus furthering the application of the TTM and further validating it in investigating smoking acquisition, as suggested by Otake and Shimai (2001) who applied the TTM in Japan. This demographic profile will could also be used to inform the design of stage-matched interventions, tailored to the specific characteristics of the individuals in different groups. Furthermore, the inclusion of variables other than the TTM constructs of Decisional Balance and Temptation, such as the Perceived Social Norms scale, may complement the Temptation and Decisional Balance variables in explaining the adolescent smoking acquisition process, thus overcoming a major limitation of the TTM (as cited by Marks, Murray, Evans and Willig, 2000).

³ See literature review: *Smoking: Causes and Correlates* for details.

METHODOLOGY

To reiterate, the major aims of this study are to investigate the stage-specific prevalence of adolescent smoking in the South African context, obtain measures of Decisional Balance and Temptation empirically associated with smoking by the TTM (Prochaska, Johnson and Lee, 1998) and measures of Perceived Social Norms to determine the validity of the TTM in smoking acquisition in this context and to investigate the possibility of using a TPB construct (perceptions of the pro-smoking norm) to complement the TTM understanding of adolescent smoking. Four research questions arise from these aims: firstly, how do the TTM constructs of Decisional Balance and Temptation relate to the different stages of smoking acquisition in a sample of South African adolescents? Secondly, are demographic variables related to stage of acquisition in any way? Thirdly, what other variables (such as parental smoking, perceived social norms, perceived adult prevalence, self-rated level of religious conviction, and amount of alcohol consumed per week) are associated with different Acquisition Stages? And, finally, do different demographic groups have significantly different trends in Decisional Balance, Temptation and Perceived Social Norms scores? The answers to these questions will inform a demographic profile of Stage of Acquisition smoking prevalence among different demographic groups, and illustrate which variables play important roles for which groups and at which stages.

Design

To investigate the differences in smoking between different demographic- and stage- groups a cross-sectional design will be employed. While a cross-sectional design is limited in that it

does not allow the inference of causal relationships between variables (for example, how changes in Decisional Balance affect stage transitions), it represents the best pragmatic compromise between methodological rigour and what may practically be attained within the time limit of a single year imposed on this study. A better design would be a longitudinal design which allows the observation of a cohort over time, thus putting the researcher in a position to establish the causal relationship between variables. The aim of this particular study, however, is to investigate the current status of South African adolescent smoking – a snapshot in time – and is therefore not seriously damaged by the use of a cross-sectional design. Furthermore, this study does not aim to describe the reasons for stage transition, but rather to provide information about what variables are salient at particular stages.

The Application of the TTM in SA

To apply the TTM to smoking acquisition in South African, it is necessary to address the following question: how do the average scores on measures of Decisional Balance and Temptation differ with each stage of smoking? Previous research asking this question reports that perceived coping pros of smoking drive smoking acquisition, as this measure increases significantly with each subsequent stage of acquisition (Pallonen, Prochaska, Velicer, Prokhorov and Smith, 1998). Social pros were suggested to play a limited role in smoking acquisition, although Marks, Murray, Evans and Willig (2000) suggest that perceived social benefits of smoking may be important to younger adolescents of between 12 and 15 years. The cons of smoking were reported to not reliably predict stage membership, although they did consistently decrease with later stage (Pallonen et al., 1998).

If the application of the TTM in the South African context yields results consistent with prior findings (e.g. Werch and DiClemente, 1994) then measures of temptation and pros of smoking should increase and cons of smoking should decrease with a later stage of acquisition (Prochaska, Johnson and Lee, 1998). This association will be measured using one-way ANOVAs with stage of acquisition as the independent variable and each of the aforementioned constructs as the dependent variables.

It is hypothesised that pros of smoking and temptation to smoke will increase with a more advanced stage of smoking while cons of smoking will show a corresponding decrease, as previous TTM smoking acquisition research suggests (Otake and Shimai, 2001; Pallonen, Prochaska, Velicer, Prokhorov and Smith, 1998). These hypotheses also follow from intuitive reasoning as it would be expected that smokers (addicted to nicotine) would be more tempted to smoke than non nicotine-addicted persons, and that smokers should view smoking as more beneficial and less detrimental than non-smokers. Furthermore, it is suggested that social pros will prove more significant earlier on while coping pros prove more salient in later stages (Prochaska et al., 1998).

Differences in Stage According to Demographic Variables

If smoking prevention interventions are to be effective they have to be matched to the acquisition stage of the recipients (Werch and DiClemente, 1994). However, it is often impractical to obtain measures of stage of acquisition from a group of potential recipients prior to the implementation of the intervention. Therefore, if there are significant trends where certain demographic groups tend to be in certain stages, membership of that demographic group would prove a useful predictor for stage of acquisition. To investigate the

association between stage and the demographic variables of grade, home language, religion and gender, the χ^2 statistic will be used.

A number of hypotheses are made with regards to the demographic variables. Based on the review of smoking acquisition literature by Marks, Murray, Evans and Willig (2000), it is hypothesised that the male gender and older age group will be associated with a later stage of smoking. Based on the findings of Flisher, Parry, Evans, Muller and Lombard (2003), it is furthermore hypothesised that black females (i.e. those speaking an African language at home) will show a significantly lower mean stage than other groups. This is because Flisher et al. (2003) found that black females tended to smoke significantly less than black males and did not show the increase in smoking behaviour with higher grade found in other groups.

Other Associations with Stage

As discussed in the literature review, the TTM has been criticised as considering only individual psychological factors in its understanding of change (Marks, Murray, Evans and Willig, 2000). Another factor found to be important in behaviour acquisition, as suggested by the TPB (Pitts, 1998), is the perception of social norms around performing that behaviour. For this reason a measure called Perceived Social Norms has been designed and it is hypothesised that a higher perception of positive smoking norms in peers, parents and the mass media will be associated with a later stage of acquisition. Similarly, the perceived prevalence of smoking has been found to be a significant predictor of smoking initiation (Alexander, Piazza, Mekos and Valente, 2001), and therefore a measure of perceived number of adults who smoke will be tested against stage of acquisition.

Parental smoking has also shown to be a powerful predictor of adolescent smoking acquisition, particularly the influence of the mother on girls (Lloyd-Richardson, Papandonatos, Kazura and Niaura, 2001). Therefore, the effects of maternal and paternal smoking will be investigated on boys and girls in separate analyses using the χ^2 statistic which will determine whether the number of boys and girls is different to what is expected if parental smoking has no effect on smoking uptake.

The literature also suggests that smoking shares a high co-occurrence with other substance use, particularly alcohol (Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura, 2002). An item asking for the average amount of alcohol consumed per week has been designed to measure this; and it is hypothesised that higher alcohol use will be associated with a later stage of acquisition. This will be statistically determined using a one-way ANOVA.

Association of demographic variables to Decisional Balance, Temptation and PSN.

As far as could be ascertained, no study has directly compared different demographic groups along the proposed dimensions. No specific hypotheses will be made, therefore. This research question will be investigated using one-way ANOVAs for each demographic variable and TTM variables combination.

Participants

The participants were drawn from a sample of four purposively selected urban high schools in KwaZulu-Natal, chosen to provide a stratified sample of students by gender and language background. From each school, one grade nine and one grade 12 class were selected by a school facilitator at their convenience and these learners were given the questionnaire. The mean age for grade 9s was 14.71 years with a standard deviation of 0.80 years. For grade 12s the mean age was 17.73 years with a standard deviation of 0.71. It should be noted that all schools are well-resourced, formerly “white”, urban schools thus limiting the results of the study to other similar schools. However, this sampling strategy yielded a mix of different demographic groups. Out of a total sample of 292, where 152 (52%) were grade 9s and 140 (47.9%) grade 12s, 130 (44.5%) were male and 154 (52.7%) were female. The remaining 2.7% of participants did not give their sex. Out of the total number of participants, 149 (51%) spoke a language of African origin (for example isiZulu or Xhosa) and 125 (42.8%) spoke a language of European origin (mostly English). While the vast majority of those speaking an African language are likely to be black, those speaking a European language at home could be white, black, Indian or coloured. Therefore, more than half the sample is likely to be black, which suggests that this sample is representative of the population of urban high-schoolers. With regards to religion, the vast majority of respondents were Christian (211 out of the 248 respondents who gave their religion [85.1%]). 11 (3.8%) respondents said they had no religion, 8 (2.7%) were Hindu, 9 (3.1%) subscribed to African Traditional beliefs, and 9 (3.1%) had a variety of other beliefs. A notable 44 (15%) respondents did not answer the question asking about religious beliefs⁴.

⁴ Appendix A gives more detailed information about the breakdown of participants.

The table below gives a breakdown of group membership frequencies within sub-groups for the variables of grade, gender and home language. There was little difference between the sexes and language groups on the basis of religion.

Grade	Language	Sex	Count (Valid N = 271)	Table %
Grade 9 (Valid n =142)	African	Male	30	11.1%
		Female	39	14.4%
	European	Male	36	13.3%
		Female	37	13.7%
Grade 12 (Valid n =129)	African	Male	36	13.3%
		Female	42	15.5%
	European	Male	22	8.1%
		Female	29	10.7%

Table 1: Frequencies of sub-group membership for Grade, Sex and Language.

Measures

To investigate the research questions a questionnaire was designed to measure Decisional Balance, Temptation, Stage of Acquisition, Perceived Social Norms and various demographic variables. The Decisional Balance and Temptation scales were adapted from existing TTM measurement instruments. Stage of Acquisition was determined using a series of yes/no type questions about the participant's recency of smoking and their current and future smoking intentions. On the basis of this series of five questions respondents were put into the Pre-Contemplation, Contemplation, Preparation, Action or Maintenance stages⁵. To re-iterate, Pre-Contemplation refers to having no intention to smoke, Contemplation refers to having some intention to smoke now or in the future, Preparation involves having taken some form of Action in the past year and intending to smoke again, Action involves having smoked in

⁵ Appendix D contains the questionnaire.

the past 30 days, and Maintenance refers to regular smoking – smoking more than 15 out of the past 30 days.

Decisional Balance was measured using an adapted version of the Smoking: Decisional Balance (Long Form) questionnaire (Cancer Prevention Research Center [CPRC], n.d.) which was designed by Velicer, DiClemente, Prochaska and Brandenburg (1985, as cited by CPRC, n.d.). This questionnaire was designed for adults and therefore some items were adjusted or omitted to make the questionnaire relevant to the adolescent population. The original questionnaire⁶ consisted of 20 items, ten measuring Pros and ten measuring Cons of smoking. The Decisional Balance scale used in this research project consisted of 15 items, 11 of which were items or adaptations of items from the original questionnaire. Four items consisting of statements more relevant to an adolescent population were added (for example, Q9 – “I look older if I smoke”). The Pros and Cons scale were subdivided into Social and Coping Pros and Social and Health Cons. In other words, some of the items in the Pros scale are concerned with social benefits of smoking and other with the coping benefits of smoking (as derived from regulation of negative affect). Likewise, the Cons scale consisted of some items measuring possible social cons of smoking, such as having bad breath, and others asked about at the health risks of smoking.

The Temptation measure was adapted from CPRC's (n.d.) measure of Temptation and Self-Efficacy relapse situations designed by Velicer, DiClemente, Rossi and Prochaska (1990, as cited by CPRC, n.d.). The CPRC measure consisted of 20 items and measured three sub-scales of Temptation, namely Positive Affect/ Social Situations, Negative Affect Situations

⁶ See appendix B for the original scale.

and Habit / Craving Situations⁷. The measure used in the present study was made up of 13 items, seven of which were from the CPRC questionnaire. It consisted of measures for a Social Situations, Affect Regulation, Boredom and Curiosity subscales. As only regular smokers would be tempted by cravings for cigarettes, it seemed of little value to include this subscale when measuring differences in stages of smoking acquisition. Instead, subscales measuring Boredom and Curiosity were included because these factors have been implicated as significant precursors to adolescent cigarette use (Marks, Murray, Evans and Willig, 2000).

The measure constructed on the basis of a literature review was the Perceived Social Norms scale. This scale measures the degree to which a person perceives peers, parents and the mass media as holding a positive normative belief towards smoking. This scale consists of seven items.

The final version of the questionnaire used in the study can be found in appendix D.

Pilot Study

In order to evaluate the appropriateness and effectiveness of the initial questionnaire, a pilot study was designed consisting of a grade nine (n=32) and grade 12 (n=29) class from a high-school in KwaZulu-Natal, total n=58. There were 18 (31%) males in the sample and 39 (67.2%) females. One person elected not to respond to the questionnaire. In the grade 9 group, ages ranged from 13.75 to 15.17 and had a mean of 14.43. In the grade 12 group ages ranged from 16.5 to 19.00 and had a mean of 17.22. As a home language 17% were Zulu

⁷ See appendix B for the original scale.

speaking, 81% spoke English and 1.7% spoke Afrikaans. 77% were Christian, 10.3% Hindu and 1.7% Muslim.

Participants were asked to critically respond to the 72 item questionnaire and to add comments about items they felt were difficult to understand or otherwise unclear. They were also asked to give feedback about other items that were not included that perhaps should have been. Another aim of the pilot study was to obtain item-total reliability indices for the various sub-scales to improve the overall reliability of the questionnaire. A third aim was to reduce the number of items in the questionnaire to less than 50 items so that the questionnaire did not become so cumbersome that participants lost interest and returned incomplete questionnaires. Data from the pilot questionnaires⁸ were entered into SPSS using the exact response for the Likert scale items, and using value labels to code the qualitative demographic responses. The results of the pilot study suggested a number of changes be made to the questionnaire.

The five *yes/no* items used to determine stage membership were altered slightly. Initially the items asked: Are you interested in smoking now; are you interested in smoking in the future; do you intend to smoke in the next 30 days; have you smoked in the past 30 days, and; have you smoked more days than not out of the past 30 days. A problem was found with the third item asking about intention to smoke in the next 30 days. This item was used to determine whether a person was in the Preparation stage of smoking acquisition. However, only one person was classified as a Preparer in this sample according to this classification. Therefore, this item was changed to: "Have you smoked in the past year?" which resulted in 6 people being placed in the Preparation stage. This is also a more theoretically accurate way of

⁸ The pilot questionnaire can be found in appendix C.

classifying the Preparation stage as the first two items determine the intentional aspect of initiating use while the later items refer to actions taken. The TTM defines Preparation as a stage characterised by both intention and action (Prochaska, Johnson and Lee, 1998) therefore having the first two items determining intention to smoke and the third item asking for smoking practices in the past year is a good index of Preparation to start smoking.

Initially, the pilot questionnaire measured Decisional Balance and Temptation with a number of sub-divisions of each as suggested by the literature review: Decisional Balance measured four sub-scales, namely Social Pros, Coping Pros, Social Cons and Health Cons; the Temptation scale was sub-divided into Social Situations, Negative Affect Situations, Habit or Craving situations, Curiosity Situations, Boredom Situations and Weight Control. A reliability analysis conducted on these 70 items included calculating Cronbach's alpha to check inter-item reliability of the sub-scales and to confirm the structure of the sub-scales in the manner suggested by Loewenthal (2001).

Subscale	Cronbach's alpha
Decisional Balance Social Pros	0.63
Decisional Balance Coping Pros	0.8872
Decisional Balance Social Cons	0.7381
Decisional Balance Health Cons	0.7364
Temptation Affect Regulation	0.9433
Temptation Boredom	0.8887
Temptation Curiosity	0.8186
Perceived Social Norms	<i>Reliability data not reported as the Perceived Social Norms scale from the pilot questionnaire was abandoned in favour of an entirely revised scale.</i>

Table 2: Reliability statistics for sub-scales after altering initial pilot questionnaire structure.

Results from the reliability analysis suggested that some items be omitted to increase inter-item agreement, the result being that the initial 70 item questionnaire was reduced to a 42

item one. The reliability analysis suggested that some sub-scales be collapsed or omitted. The resultant sub-scales and corresponding reliability index (Cronbach's alpha) are laid out in table 2 on the previous page. It should be noted that the subscale labelled "Affect Regulation" consisted of both affective- and socially- oriented items of the initial item conceptualisation.

Loewenthal (2001) suggests that reliability of 0.6 and above is adequate for a subscale with a small number of items therefore making the reliability of these subscales suitable. The original Perceived Social Norms scale was completely reworked after the pilot study as it showed unacceptably low levels of reliability and appeared to have poor construct validity. The scale was measuring perceived social benefits more than the degree to which the respondent believed smoking behaviour to be favoured by significant others, as suggested by the TPB (Pitts, 1998) and was thus replaced entirely with seven items measuring the extent to which the respondent perceived pro-smoking social norms.

The results of this pilot study, however, were likely to have limited reliability when compared to results using a larger sample due to the small sample size (n=58). Therefore, it was anticipated that the main study would produce different reliability statistics and a different sub-scale structure altogether, however, in practice it turned that the proposed questionnaire structure showed high reliability for most of the sub-scales in the final analysis (n=292).

Summary of Measures

The measures are included in a questionnaire of 42 items plus an additional ten items acquiring demographic information (See Appendix D). The first section of the questionnaire

asks for school attended, grade, age (in years and months), sex, home language, religion, religiosity, maternal and paternal smoking, and number of adults who are perceived to smoke.

A five item measure (Q1 - Q5) asks about participant smoking practices in order to classify them into one of the five stages.

The Decisional Balance scale contains items measuring Social Pros (Q8 - Q10), Coping Pros (Q11 - Q14), Social Cons (Q15 - Q18) and Health Cons (Q19 - Q22). Social Pros are the perceived social benefits of smoking, Coping Pros/Cons are the perceived benefits/risks due to affect regulation and stress reduction, and Health Cons measure the perceived health risks of smoking.

The Perceived Social Norms scale consists of seven items (Q23 - Q29) and measures the extent to which participants perceive the pro-smoking norm in the media and significant others.

The Temptation scale measures the extent to which people are tempted to smoke in certain situations. These situations are measured by the Social Situations sub-scale (Q30, Q31, Q37 and Q38), which measures temptation in socially oriented situations, the Affect Regulation sub-scale (Q32 - Q36), which measures temptations to smoke in times of stress or anxiety, the Curiosity sub-scale (Q41, Q42), which refers to temptation to smoke resulting from curiosity, and the Boredom sub-scale (Q39, Q40), which measures temptations to smoke in situations characterised by boredom.

Procedure

The implementation of this design took place over several months, beginning in February 2004 with negotiating with schools to gain permission to implement the questionnaire and ending in June 2004 with the analysis of the data in SPSS.

Five schools were contacted telephonically with a proposal for the research project and four schools agreed to participate. The school liaison was in all cases the life-skills facilitator with whom it was agreed that this facilitator would give the questionnaire to a grade 9 and a grade 12 class at the beginning of a lesson. The facilitators were requested to tell the respondents that the questionnaire was about attitudes towards smoking and to ensure them of their right to confidentiality⁹. The participants' rights were fully explained on a covering page of the questionnaire (see appendix D) and facilitators were asked to draw their attention to this. This procedure ensured that all respondents filled in the question in a standardised classroom setting with the same set of instructions.

Once the questionnaires were completed they were collected from the schools and the responses entered into SPSS. For demographic information such as language and religion labels were generated as new responses were found. Categories consisting of a small number of participants were later collapsed to facilitate the statistical analyses performed on the data. Demographic information was largely coded as categorical except for age which obviously was on the interval scale. Yes/No answer formats such as for the items determining stage membership were coded as 0 for no and 1 for yes. The Likert scale type items (which were most of the items in the questionnaire and measured the Decisional Balance, Temptation and

⁹ See Appendix E for the instructions sent to facilitators.

Perceived Social Norms scales) were coded using the exact response given by the respondent (that is, a number between one and five, inclusive).

Once the data were stored in an SPSS database, descriptive statistics were generated and statistical analyses were carried out as described below.

Ethical Considerations

Care was taken in the implementing of this study that welfare and rights of all individual respondents and their schools were preserved. Durrheim and Wassenaar (1999) suggest that any research project should adhere to three ethical principles: autonomy – referring to individuals participating in research only when they are informed of what it entails and give their full voluntary consent to participate; nonmaleficence – that research should not in any way harm, or expose to undue risk, a participant or any other person; and beneficence – that research should offer some benefit to either the participants themselves, society at a broader level or other researchers (Durrheim and Wassenaar, 1999). To deal with the latter principles first, the measurement instrument of this study was a simple questionnaire that did not ask provocative or potentially harmful questions, nor did it offer any information about smoking that might lead a participant to smoke. The questionnaire was implemented in a normal classroom environment under the supervision of a trained teacher. The participants were therefore not at any risk of harm through the implementation of the research, or by any information contained in the questionnaire. The potential benefits of the study, on the other hand, are numerous: in the first instance, the questionnaire may have provoked questions about the dangers of smoking and why people begin to smoke which could have lead to greater enlightenment about smoking and its consequences. In the second instance, the data

gained from this study is specifically aimed at informing interventions to reduce the incidence and prevalence of adolescent smoking, which is established as a significant health risk. Thirdly, as a study of this kind has not previously been carried out in this context, the study offers theoretical benefits to other academics and prevention programme designers by furthering the knowledge of the TTM and its applications in smoking prevention.

This study was ethically sound by having a favourable risk-benefit ratio but, as well as this, care was taken to inform participants about the nature of the study, and obtain their full permission to participate. Their right to confidentiality was also ensured. Participants were informed of these things on a covering page of the questionnaire which they were instructed to read carefully by their teacher. This covering page also functioned to prevent other people from seeing the answers on the completed questionnaire. Participants were informed that the study was measuring attitudes towards smoking. They were asked to only fill in the questionnaire if they wanted to, and not to feel obliged to do so. They were also ensured that nobody would know which questionnaire was theirs and that their school would not be informed of the results of individuals or classes. The covering page and its instructions can be seen in Appendix D. The schools were also ensured in a letter¹⁰ that the confidentiality of the school would be respected with regards to their participation and the research results. They were also ensured that the results as published in this report would be made available to them in a condensed form should they want them.

¹⁰ See Appendix E

Exploratory Data Analysis

As suggested by Howell (2002), the first step in the data analysis process was exploratory data analysis to obtain a preliminary impression of trends and differences, as well as to test the assumptions made in parametric statistical tests. The exploratory data analysis consisted of generating frequency or descriptive statistics and graphs for variables, a missing data analysis and a reliability analysis to investigate the reliability of the sub-scale structure.

Frequencies and Descriptives¹¹

One notable attribute of the frequency data was the small number of participants in the Contemplation stage (n=5). Contemplators were characterised by having either an intention to smoke now or an intention to smoke sometime in the future. As the small number of cases in this group would detrimentally affect statistical analyses – especially the Chi-squared (χ^2) statistic as it assumes an expected frequency of at least 5 in each cell (Howell, 2002) – it was decided to collapse the Pre-Contemplation and Contemplation groups. This grouping was thought to be preferable to a grouping with the Preparation stage because both Pre-Contemplation and Contemplation are characterised by having not yet smoked a cigarette. The new Pre-Contemplation group can thus be thought of as a never-smoking group, a small number of whom may have intentions to smoke in the future.

For descriptive statistics for continuous demographic variables and Decisional Balance, Temptation and Perceived Social Norms please see Appendix F.

¹¹ For frequency pie charts of demographic variables see appendix A.

Stage of Acquisition				
		Frequency	Percent	Valid Percent
Valid	Pre-Contemplation	155	53.1	53.1
	Preparation	70	24.0	24.0
	Action	31	10.6	10.6
	Maintenance	36	12.3	12.3
	Total	292	100.0	100.0

Table 3: Frequency of group membership for Stage of Acquisition.

Assumptions

The descriptive statistics were also used to test the assumption of normality of the ANOVA procedure. Many of the test variables to be examined in this way showed a departure from normality using the Shapiro-Wilk statistic, which has been included in Appendix F along with a few histograms that are exemplary of the deviations from normality within stage subgroups for the Decisional Balance and Temptation variables. (All graphs were not included as there are more than 45 groups in the analyses.)

Another important assumption of ANOVA is that each group variance is approximately equal – the assumption of homogeneity of variance. This assumption was tested statistically using Levene’s statistic in SPSS. This statistic tests the null hypothesis that the group variances are equal (Howell, 2002). A substantial number of test variables were found to have heterogeneous variances¹². The heterogeneity of variances suggests that while some test variables might predict stage accurately (by having a low variance), others are not as good predictors of stage (this is indicated by high within-group variances which suggest that members of certain groups are be different on scores of certain variables). If a test variable is

¹² See Appendix F for the Levene’s test results.

a good predictor of stage, then one would expect low within-group variances for every stage. The high variances of some groups suggest that factors other than those under investigation also influence the score on certain test variables. In the case of groups with high variances, it may therefore be accurate to infer the presence of subgroups within the stages – perhaps, for example, participants in the Maintenance stage could be classified into two different groups on the basis of the Boredom Temptation sub-scale, as the maintenance stage shows high internal variance on this measure. Simply put, some people in the Maintenance stage are tempted to smoke when they are bored – others are not. However, this is beyond the scope of the present study and these questions will require additional research projects to answer.

In addition to deviations from normality and heterogeneous variances, the sample sizes were also unequal which furthermore compounds the problem. It was therefore decided to use the Welch procedure which compares group means as a robust alternative to ANOVA as suggested by Howell (2002). In practice, however, both the Welch and *F*-statistics produced very similar results, the main difference being that the Welch test was more sensitive to differences which resulted in the Decisional Balance Cons scale showing a significant difference across stages whereas it was not found statistically different with ANOVA. Naturally, a statistical test that was more robust *and* more sensitive was far preferable to its alternative and therefore the Welch procedure was used whenever variances were found to be heterogeneous using Levene's statistic.

Missing Data Analysis

Upon examining the database, it was noticed that a large amount of data was missing. 49.7% of respondents left out at least one item, but 95.2% of participants omitted only five or fewer

out of the 52 items. Only seven participants (2.4%) failed to respond to more than 10 items. There was no single particular item that was regularly left out, but a fair number of respondents did not give demographic information, especially to do with religion (15.1%) and language background (6.2%)¹³. It was evident that some respondents filled in the questionnaire only half-heartedly as in three or four cases entire sections were omitted. It was thought that some pattern of data omission may exist and therefore more detailed analyses of missing data were performed as follows. A new variable was created called “missing” and the number of missing items per case was counted and saved in the new variable. This variable then served as the dependent variable for a number of one-way ANOVAs to determine whether any demographic variables were associated with missing data¹⁴. One of the four schools was found to have significantly more missing data than other schools, $F(3) = 8.262$, $p < 0.01$. This is most likely due to the degree of supervision present in the classroom at the time resulting in participants not completing the questionnaire, however, and is probably not indicative of a systematic trend in missing data. Other variables tested were Grade, Language, Sex, Religion and Stage, none of which were statistically related to the number of missing items. It was noted, however, that participants in the Maintenance stage had on average more than double the number of missing items than those in the Pre-Contemplation stage. This suggests that smokers may be more likely to leave out items than non-smokers, possible due to smoking being associated with rebelliousness (Leventhal and Cleary, 1980). If this is true then it is likely that the number of smokers in the sample is under-representative of those in the population as many smokers may have elected not to fill in a questionnaire at all. Alternatively, the omission of items by smokers and non-smokers alike could be attributed to social desirability, where participants either want to appeal to the authority figures who they

¹³ See Appendix F for more details on missing data.

¹⁴ See Appendix F for the SPSS output for these calculations.

perceive as anti-smoking or to the pro-smoking norm of their peers. However, this difference was not statistically significant ($t = 1.130, p = 0.266$).

Despite some cases having missing data, every questionnaire at least partially completed was used in analyses where a complete data set was available for the particular analysis. No attempt was made to replace missing data for two reasons: firstly, as most of the items were on five-point Likert scales, statistically imputing the missing values would be difficult and, secondly, the data seemed to be missing at random which suggests that leaving out this data will be of little consequence to the results of the analysis. Replacing missing values with mid-points or group means was decided against as this practice is based almost entirely on speculation and, especially where within-group variances are high, functions to reduce these variances thereby artificially increasing the power of statistical tests (especially ANOVA). The statistical gains of replacing the missing data with a best-guess estimate were small – the reduction in sample size if these data were left out was small (most analyses used at least 270 of the 292 cases) – and therefore it was decided not to impute missing values.

Reliability Analysis

The reliability analysis was conducted to determine the extent to which items purportedly measuring the same construct (for example, the Social Pros sub-scale) were similar. The reliability analysis was also aimed at determining whether the Decisional Balance and Temptation measures could be better explained with the use of sub-scales and, if so, what the most reliable structure for these scales would be. The analysis was conducted in a similar manner to which the reliability analysis was performed on the pilot data, and used the reliability analysis and factor analysis functions of SPSS.

Decisional Balance

This scale was designed with 15 items – seven measuring Pros and 8 Cons. Q8 to Q10 measured Social Pros, Q11 to Q14 measured Coping Pros, Q15 to Q17 Social Cons, and Q18 to Q22 measured Health Cons. Cronbach's alpha was calculated for each of these sub-scales with results as follows: Pros $\alpha = 0.8343$; Cons $\alpha = 0.8586$; Social Pros $\alpha = 0.55$; Coping Pros $\alpha = 0.8492$; Social Cons $\alpha = 0.6186$; Health Cons $\alpha = 0.8361$. The lower item-total reliability for the Social Pros ($\alpha = 0.55$) and Social Cons ($\alpha = 0.6186$) sub-scales suggested that the scale structure was of questionable reliability. A factor analysis was therefore conducted on the Decisional Balance scale to determine the underlying sub-scale structure. The principal components analysis yielded three components with eigenvalues over 1.00, the first of which consisted of the entire Cons scale, confirming the reliability of that scale. The second factor consisted of Coping Pros and one item from the Social Pros scale. The final component was made up of the remaining two Social Pros items¹⁵. The item-total correlation reliability coefficients for these factors were $\alpha = 0.8586$ for Cons, $\alpha = 0.8568$ for the second component (Coping Pros) and $\alpha = 0.5859$ for the remaining two Social Pros items. This suggests that the structure suggested by this factor analysis would be preferable to the existent structure due to the higher alpha values, however, Loewenthal (2001) suggests that lower alpha values are acceptable if there is a small number of items in the scale and there is a sound theoretical or practical reason for using the scale. In this case the number of items is small and there is good theoretical evidence for the Social Pros, Coping Pros and Cons sub-scales as this Decisional Balance structure was suggested by Pallonen, Prochaska, Velicer, Prokhorov and Smith (1998) – the authors who researched the TTM extensively in the area of smoking acquisition.

¹⁵ See Appendix F- *Reliability Analysis* for detailed data.

Therefore the existent structure of Social Pros, Coping Pros, Social Cons and Health Cons will be maintained.

Perceived Social Norms

The Perceived Social Norms scale showed relatively low item-total reliability ($\alpha = 0.5821$). This, however, represented the alpha value obtained from the best combination of items. Leaving out any of the items would only have resulted in a lower Cronbach's alpha. However, once again referring to Loewenthal (2001), this level of reliability is acceptable for a scale of fewer than ten items (number of items is seven) and where there is good theoretical support for the scale (see Methodology – *Measures*).

Temptation

The results of the pilot questionnaire (see Methodology – *Measures*) suggested that the Temptation scale was made up of three components: Affect Regulation (Q30 – Q36), Boredom (Q37 – Q40) and Curiosity (Q41-Q42). However, it was a point of concern that a tempting factor used to describe smoking acquisition by Pallonen, Prochaska, Velicer, Prokhorov and Smith (1998) – namely a social situations temptation – was not specifically named in this structure, despite having items that asked questions of a social nature (these items were assimilated into the Affect Regulation component after the reliability analysis of the pilot questionnaire). Theoretically, the Temptation scale could be made up of four sub-scales: Social, Affective, Curiosity and Boredom (see literature review - TTM). For this reason a factor analysis asking for four factors was requested from SPSS¹⁶. This analysis

¹⁶ See Appendix F – *Reliability Analysis*

yielded a slightly different structure to the one that existed – one that was both statistically and theoretically better than its predecessor. The four components were as follows: the first consisted of items Q30, Q31, Q37 and Q38 (Cronbach's $\alpha = 0.8768$) and were of a social nature; component two was Q32 – Q36 (Cronbach's $\alpha = 0.9336$) which were items about affective regulation; the third component (Q41, Q42; $\alpha = 0.8597$) dealt with items about curiosity; and the fourth component (Q39, Q40; $\alpha = 0.9350$) consisted of items asking about boredom. This structure fits both theoretically with studies by Pallonen et al. (1998) and statistically with high alpha values. These four components together explain 82.125% of the variance in temptation scores.

Data Analysis

The data were analysed using SPSS 11.5.1 as discussed in Methodology – *Design* above. Two statistical techniques were employed: one-way ANOVA and the Chi-squared statistic. The one-way ANOVAs were used to find differences between acquisition stages on the basis of a variety of other variables. Tukey's HSD *post hoc* tests were requested of SPSS, along with Levene's test for homogeneity of variances. ANOVA using the robust Welch procedure was also run in the event that significantly heterogeneous variances were found. Omega squared (ω^2) was calculated using Microsoft Excel as a measure of effect size for ANOVA. The ω^2 statistic gives an estimate of the reduction in error of the estimate of the dependent variable on the basis of the independent variable, making it comparable to r^2 , and is a less biased estimate of effect size than the more easily calculated η^2 (eta squared) (Howell, 2002).

The χ^2 statistic was used to find associations between categorical variables (such as stage and demographic variables). Adjusted residuals for the observed-expected cell count differences were calculated, which are measured in standard deviation units (that is, z-scores). The adjusted residuals in χ^2 are analogous to post hoc tests in ANOVA and allow direct comparisons between groups to determine which groups differ statistically from their expected counts. Effect sizes were estimated by calculating Cramer's V (using SPSS) and odds ratio which were calculated by hand according to the procedure outlined by Lachenicht (2002).

RESULTS

Descriptive Statistics and Summary

The following three tables summarise the frequencies and means of all the variables analysed in this study. For more detailed descriptive statistics, please refer to Appendix F – *Descriptive Statistics and Summary Tables*.

On the following page is a table summarising the frequency of occurrence of different demographic variables acquisition for each stage. Significant associations are indicated by the footnotes.

The page after shows a table summarising the mean scores of Decisional Balance, Temptation, Perceived Social Norms, and Religiosity for the variables Acquisition Stage, Gender, Grade and Home Language smoked. A separate table indicates which differences are significant.

Table 4: Demographic Frequencies of Stages showing Statistically Significant Differences.

			Stage of Change											
			Pre-Contemplation			Preparation			Action			Maintenance		
			Count	% in Stage	Column %	Count	% in Stage	Column %	Count	% in Stage	Column %	Count	% in Stage	Column %
Home Language	African	Male	32	48,5%	36,8%	17	25,8%	45,9%	8	12,1%	61,5%	9 ^b	13,6%	90,0%
		Female	55 ^c	67,9%	63,2%	20	24,7%	54,1%	5	6,2%	38,5%	1	1,2%	10,0%
	European Origin	Male	28	48,3%	47,5%	11	19,0%	39,3%	7	12,1%	50,0%	12	20,7%	52,2%
		Female	31	47,0%	52,5%	17	25,8%	60,7%	7	10,6%	50,0%	11	16,7%	47,8%
Grade	Grade 9		81	53,3%	52,3%	41	27,0%	58,6%	15	9,9%	48,4%	15	9,9%	41,7%
	Grade 12		74	52,9%	47,7%	29	20,7%	41,4%	16	11,4%	51,6%	21	15,0%	58,3%
Mother Smoke	No	Male	56	50,0%	39,7%	26	23,2%	48,1%	12	10,7%	50,0%	18	16,1%	78,3%
		Female	85	65,4%	60,3%	28	21,5%	51,9%	12	9,2%	50,0%	5	3,8%	21,7%
	Yes	Male	5	31,3%	45,5%	3	18,8%	25,0%	3	18,8%	75,0%	5	31,3%	41,7%
		Female	6 ^d	26,1%	54,5%	9	39,1%	75,0%	1	4,3%	25,0%	7 ^e	30,4%	58,3%
Father Smoke	No	Male	47	50,5%	41,6%	21	22,6%	47,7%	9	9,7%	50,0%	16	17,2%	66,7%
		Female	66	62,3%	58,4%	23	21,7%	52,3%	9	8,5%	50,0%	8	7,5%	33,3%
	Yes	Male	14	46,7%	41,2%	5	16,7%	26,3%	5	16,7%	55,6%	6	20,0%	60,0%
		Female	20	47,6%	58,8%	14	33,3%	73,7%	4	9,5%	44,4%	4	9,5%	40,0%
Religion	None		2	18,2%	1,5%	2	18,2%	3,6%	2	18,2%	7,4%	5	45,5%	16,7%
	Christian		122	57,8%	89,7%	47	22,3%	85,5%	23	10,9%	85,2%	19	9,0%	63,3%
	Hindu		5	62,5%	3,7%	2	25,0%	3,6%	0	,0%	,0%	1	12,5%	3,3%
	African Traditional		5	55,6%	3,7%	3	33,3%	5,5%	0	,0%	,0%	1	11,1%	3,3%
	Other		2	22,2%	1,5%	1	11,1%	1,8%	2	22,2%	7,4%	4	44,4%	13,3%

- a. Violation of assumption of normality due to small cell sizes results in difficulty drawing conclusions.
- b. Significantly higher occurrence of males than expected, $p < 0.05$.
- c. Significantly higher occurrence of females than expected, $p < 0.05$.
- d. Significantly fewer females in pre-contemplation when mother smokes than when she does not, $p < 0.01$.
- e. Significantly more females in maintenance when mother smokes than when she does not, $p < 0.01$.

Table 5: Variable Scores by Sex, Grade, Language and Stages.

	Sex		Grade		Home Language		Stage of Change			
	Male	Female	Grade 9	Grade 12	African	European	Pre-Cont.	Preparation	Action	Maintenance
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Social Pros	,38	,36	,37	,37	,36	,38	,32	,38	,45	,51
Coping Pros	,43	,40	,42	,40	,37	,45	,31	,43	,54	,74
Pros	,41	,38	,40	,39	,37	,42	,31	,41	,50	,64
Social Cons	,65	,65	,68	,62	,66	,63	,67	,67	,61	,53
Health Cons	,77	,78	,79	,77	,78	,78	,78	,79	,76	,75
Cons	,73	,74	,75	,72	,74	,73	,75	,75	,71	,67
Perceived Social Norms	,52	,50	,53	,49	,51	,51	,49	,54	,53	,56
Temptation	,37	,35	,38	,34	,32	,41	,26	,37	,44	,71
Social Situations	,37	,35	,37	,35	,33	,41	,25	,38	,50	,70
Affect Regulation	,39	,36	,38	,36	,32	,44	,26	,36	,43	,82
Boredom	,33	,31	,34	,30	,29	,36	,23	,32	,36	,70
Curiosity	,38	,40	,44	,35	,38	,42	,32	,48	,44	,49
How Religious	3,03	3,14	3,14	3,05	3,27	2,88	3,24	3,27	2,85	2,33
# Cigarettes past year	991	133	820	147	773	239	0	21	30	4748

Table 6: Statistically significant differences of variables across Sex, Grade, Language & Stage.

	Comparisons of Column Means										
	Sex		Grade		Home Language		Stage of Change				
	Male	Female	Grade 9	Grade 12	African	European	Pre-Conte	Preparation	Action	Maintenance	
	(A)	(B)	(A)	(B)	(A)	Origin	mplation	(A)	(B)	(C)	(D)
Social Pros									A	A	A B
Coping Pros						A			A	A B	A B C
Pros						A			A	A B	A B C
Social Cons			B					D	D		
Health Cons											
Cons											
Perceived Social Norm			B						A		A
Temptation						A			A	A	A B C
Social Situations						A			A	A B	A B C
Affect Regulation						A			A	A	A B C
Boredom						A			A	A	A B C
Curiosity			B						A		A
How Religious					B			D	D		
# cigarettes past year											A B C

Results are based on two-sided tests assuming equal variances with significance level 0.05. For each significant pair, the key of the smaller ca larger mean.

a. Tests are adjusted for all pairwise comparisons within each innermost subtable using the Bonferroni correction.

*Application of Stage Model in SA*²⁰

Difference in average scores of Decisional Balance and Temptation by Stage of Acquisition

One-way ANOVAs were planned to analyse these differences; however, the problem of heterogeneity of variances resulted in using the more robust Welch procedure. The results of this test are summarised in the table below. Each stage of acquisition was significantly different on each of the Decisional Balance sub-scales, except for Health Cons ($p = 0.483$).

Robust Tests of Equality of Means

		Statistic(a)	df1	df2	Sig.	ω^2 Effect Size
Social Pros	Welch	17.171	3	84.292	.000	0.146
Coping Pros	Welch	86.604	3	80.225	.000	0.444
Pros	Welch	68.558	3	81.930	.000	0.392
Social Cons	Welch	7.161	3	87.214	.000	0.047
Health Cons	Welch	.826	3	96.108	.483	-0.005
Cons	Welch	3.200	3	94.440	.027	0.011
Temptation	Welch	109.138	3	73.329	.000	0.571
Social Situations	Welch	84.660	3	72.162	.000	0.524
Affect Regulation	Welch	159.493	3	79.752	.000	0.544
Boredom	Welch	39.395	3	69.265	.000	0.448
Curiosity	Welch	8.892	3	74.462	.000	0.087

a Asymptotically F distributed.

Table 7: Welch test for equality of means for data with heterogeneous variances for Decisional Balance and Temptation by Stage of Acquisition.

Post hoc tests for Decisional Balance using Tukey’s HSD are shown in detail in Appendix G. To summarise, the Coping Pros scale and Pros combined scale were significantly different at each Stage ($p < 0.01$). The differences with Social Pros were statistically significant between Pre-Contemplation and Preparation, Preparation and Maintenance, and Pre-Contemplation

²⁰ See Appendix G – *Applicability of Stage construct in SA* for results of analysis

and Action ($p < 0.05$). Cons, on the other hand, showed less of a difference: Social Cons differentiated between the Pre-Contemplation and Maintenance stages ($p < 0.01$) and Preparation and Maintenance stages ($p < 0.01$) only, while Health Cons were not statistically different from stage to stage. The Cons scale was statistically different using the Welch procedure ($p < 0.05$), but post hoc testing found no statistically significant differences (although this is probably due to the violation of the assumption of homogenous variances). The Cons scores decreased towards Maintenance as a general trend. These findings are summarised in figure 1 below.

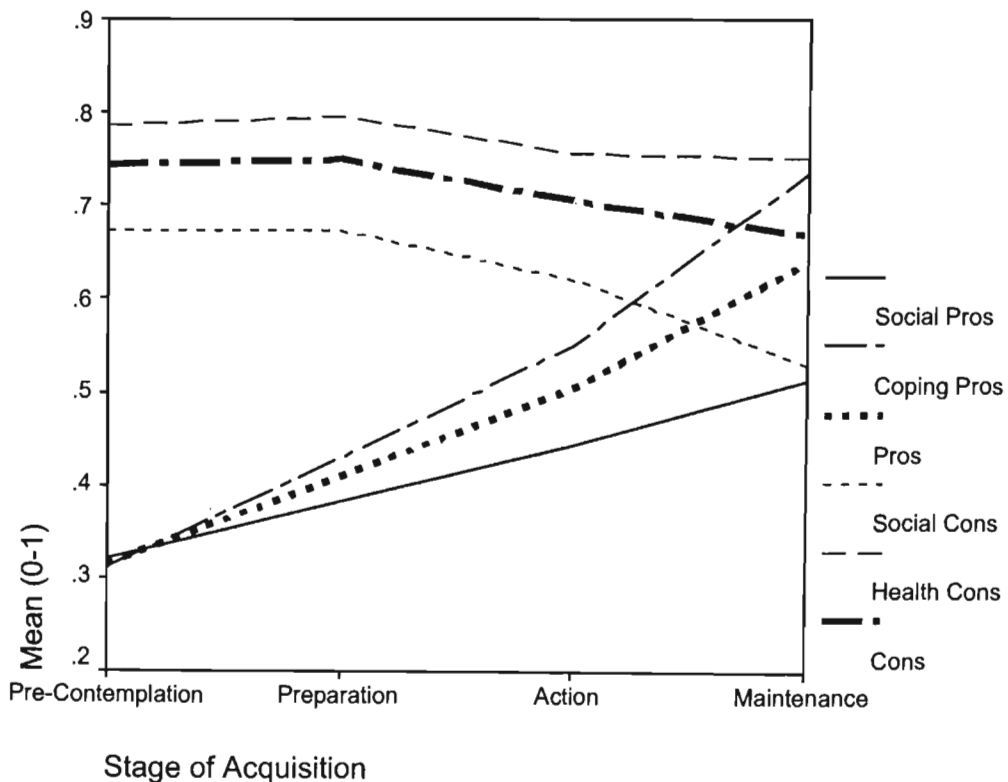


Figure 1: Mean Decisional Balance scores across stages.

Decisions to smoke, therefore, were based more on the perceived stress management and coping benefits of smoking than on the perceived social benefits, although this was still an important factor. This partly confirms the hypothesis that the Social Pros scale would

increased more rapidly between earlier stages, while the Coping Pros scale would be show most of its increases later on (from Pallonen, Prochaska, Velicer, Prokhorov and Smith, 1998) – indicative of social factors motivating adolescents to begin smoking, but affective regulation continuing the progression through to Maintenance. Interestingly, perceptions of the potential health risks of smoking – and indeed, all cons of smoking – were high at all stages (illustrated in figure 1), but the lack of difference in health cons scores suggests that knowledge of health risks does little to discourage smoking. Similarly, perceived social cons – such as smoking as an embarrassing habit or smoking harming others – was also not much different from stage to stage, with the exception that Pre-contemplators were significantly lower than Maintainers on this measure. Therefore, the perceived cons of smoking are thus not as effective as dissuading adolescents from smoking as the pros are in encouraging it.

In contrast to Decisional Balance, however, the Temptation construct and its subscales were found statistically different between stages by the Welch procedure on all counts ($F= 109.14$, $p < 0.01$). Figure 2 on the next page illustrates these differences.

Post hoc testing determined that Temptation was statistically different at each stage, as was the Social Situations scale ($p < 0.05$). Affect Regulation and Boredom scores were significantly different between all but the Preparation and Action Stages ($p < 0.05$). The Curiosity sub-scale increased significantly from Pre-Contemplation to Preparation ($p < 0.01$), decreased non-significantly to Action, and then increased to Maintenance. The difference between Pre-Contemplation and Maintenance was statistically significant ($p < 0.01$)²¹. These findings are illustrated in figure 2, where social temptations are slightly higher than coping temptations in Preparation and Action. However, social temptations increase with

²¹ See Appendix G for details of this analysis

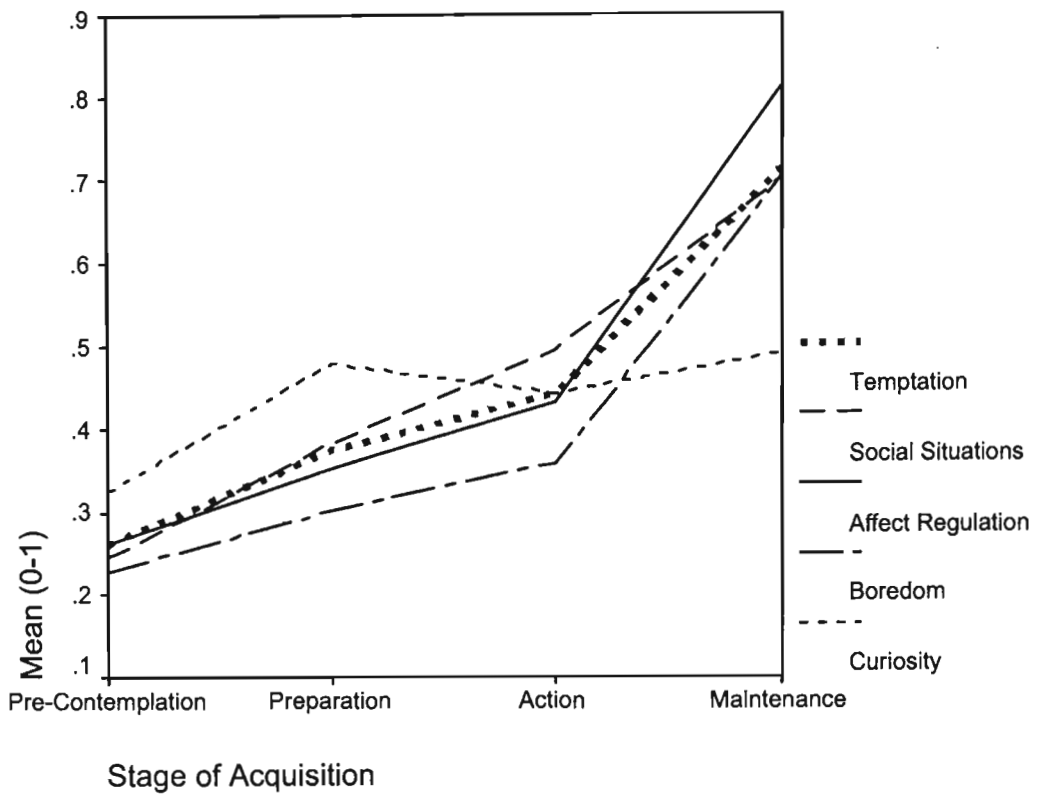


Figure 2: Differences between stages on Temptation sub-scales.

later stage, illustrating the importance of social factors at all stages. Affective regulation temptations, however, did show a greater increase in later stages, especially between the Action and Maintenance stages which is probably indicative of a psychological and physiological dependence on nicotine, which probably becomes significant at this stage. High effect sizes suggest that all tempting factors (except for curiosity – see table 7 above) contribute significantly to the prediction of stage. This confirms the assertion of Velicer, Prochaska, Fava, Norman and Redding (n.d.) that temptation (and by implication self-efficacy) factors play a significant role in progressive and regression stage transitions.

Differences in Stage According to Demographic Variables²²

The analysis was run using χ^2 to measure the level of association between Stage of Acquisition and gender, grade, language background and religion. In order to test the hypothesis that black females tend towards a lower stage, African and European language speakers were included in separate layers in the Gender by Stage contingency table.

Language

While the association between language and smoking stage is a weak one (Cramer's $V = 0.189$), the relationship is statistically significant ($\chi^2 = 9.785, p < 0.05$). There were significantly more European language speakers in the Maintenance stage than expected (adjusted standardized residual = 3.0, $p < 0.01$) and significantly more African language speakers in the Pre-Contemplation stage (adjusted standardized residual = 2.0, $p < 0.05$). This suggests that European language speakers are at a higher risk of smoking than Africans.

Gender

When all participants were included in a single contingency table, males were found to be significantly more likely to be in a later stage than females ($\chi^2 = 8.086, p < 0.05$). The adjusted standardised residual for males in Pre-Contemplation was -1.9 ($p = 0.057$) and for males in Maintenance was 2.5 ($p < 0.05$). There was little difference in the Preparation and Action stages. When separate analyses were conducted for African language speakers and European language speakers, however, a different pattern emerged. In the European language

²² See Appendix H for details of these analyses

analysis there was no significant association between stage and gender ($\chi^2 = 0.970$, Cramer's $V = 0.088$, $p = 0.809$). Figure 3 below illustrates the similarities between boys' and girls' smoking stage membership.

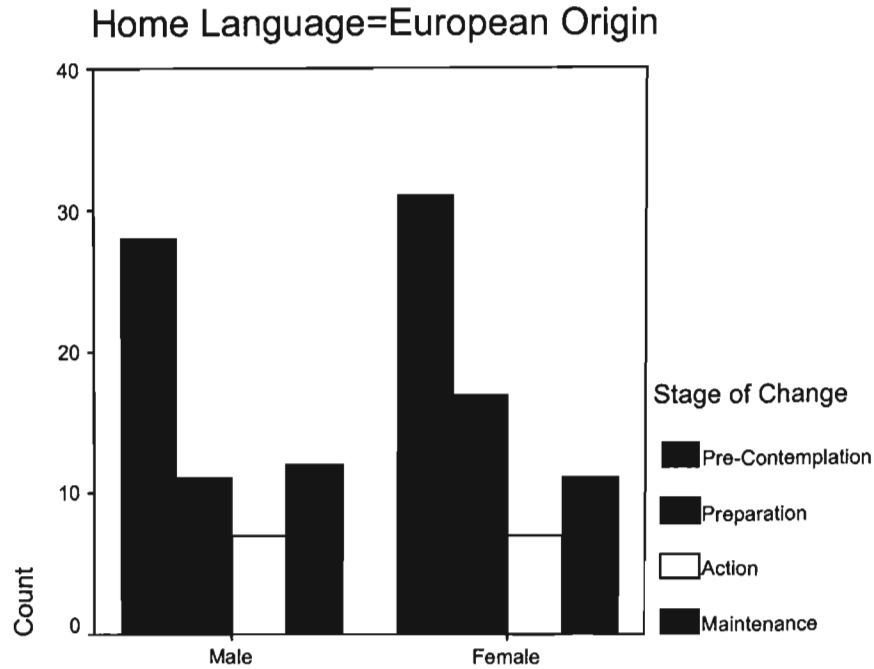


Figure 3: Stage of smoking frequencies for male and female European language speakers.

Among African language speakers, however, the association between gender and smoking was statistically significant ($\chi^2 = 12.010$, $p < 0.01$), although the relationship was not particularly strong (Cramer's $V = 0.286$, $p < 0.01$). Males were more likely to be in a later stage of smoking than females, who were more likely to be in an earlier stage, as is clearly shown in figure 4. This finding confirms the hypothesis that African language speaking females tend to be at a lower risk for smoking than their male counterparts. The calculated odds ratio ($9/32 / 1/55$) indicated a 15.4 greater likelihood of an African language speaking girl being in the Pre-contemplation rather than Maintenance stage.

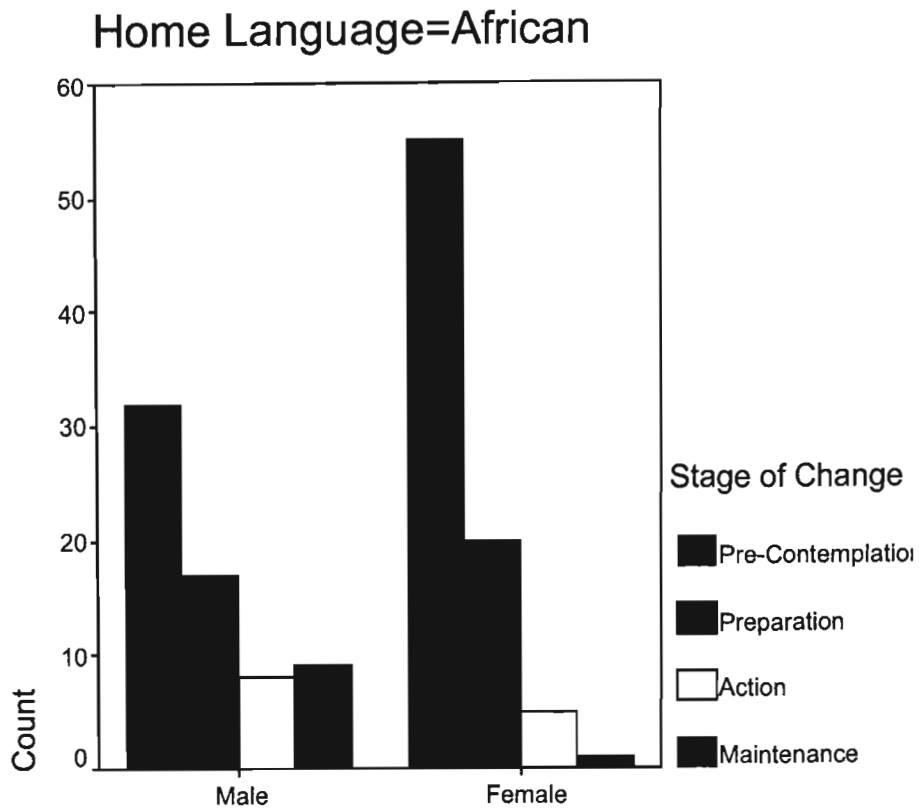


Figure 4: Stage of smoking frequencies for male and female African language speakers.

Table 8 on the following page summarises the findings of the relationship between language, gender and smoking stage. The comparisons between African- and European- language speakers in smoking stage can be seen in the contingency table below. Adjusted residual scores are included in the table which can be interpreted as the standardised difference between the observed and expected cell count. An absolute adjusted residual value of 1.96 or greater represents a statistically significant deviation from the expected count at the 0.05 significance level. African language speaking males and European language speakers show comparable smoking patterns while African language speaking girls smoke significantly less, showing far fewer members in the Maintenance group (Adjusted Residual = -3.0, $p < 0.01$) and far more members in the Pre-contemplation group (Adjusted Residual = -2.4, $p < 0.01$).

Gender * Stage of Acquisition * Home Language Crosstabulation

Home Language			Stage of Acquisition				Total
			Pre-Cont.	Preparation	Action	Maintenance	
African Origin	Male	Count	32	17	8	9	66
		Expected Count	39.1	16.6	5.8	4.5	66.0
		Adjusted Residual	-2.4*	.1	1.3	3.0*	
	Female	Count	55	20	5	1	81
		Expected Count	47.9	20.4	7.2	5.5	81.0
		Adjusted Residual	2.4*	-.1	-1.3	-3.0*	
	Total	Count	87	37	13	10	147
		Expected Count	87.0	37.0	13.0	10.0	147.0
	European Origin	Male	Count	28	11	7	12
Expected Count			27.6	13.1	6.5	10.8	58.0
Adjusted Residual			.1	-.9	.3	.6	
Female		Count	31	17	7	11	66
		Expected Count	31.4	14.9	7.5	12.2	66.0
		Adjusted Residual	-.1	.9	-.3	-.6	
Total		Count	59	28	14	23	124
		Expected Count	59.0	28.0	14.0	23.0	124.0

Table 8: Cross tabulation of Gender and Stage for African and European languages.

An * indicates a significant difference from expected cell count.

Grade

There was no statistically significant difference between grade 9 and grade 12 participants with regard to stage ($\chi^2 = 2.917, p = 0.405$) and the association between these two variables is weak (Cramer's $V = 0.100$). There were, however, more grade 12s (15%) than grade 9s (9.7%) in the Maintenance stage and fewer grade 12s (20.7%) than grade 9s (30.0%) in the Preparation stage, as is illustrated by figure 5 below. These findings held true even when males and females were analysed in separate contingency tables. This finding is against the hypothesised increase in smoking in older age groups.

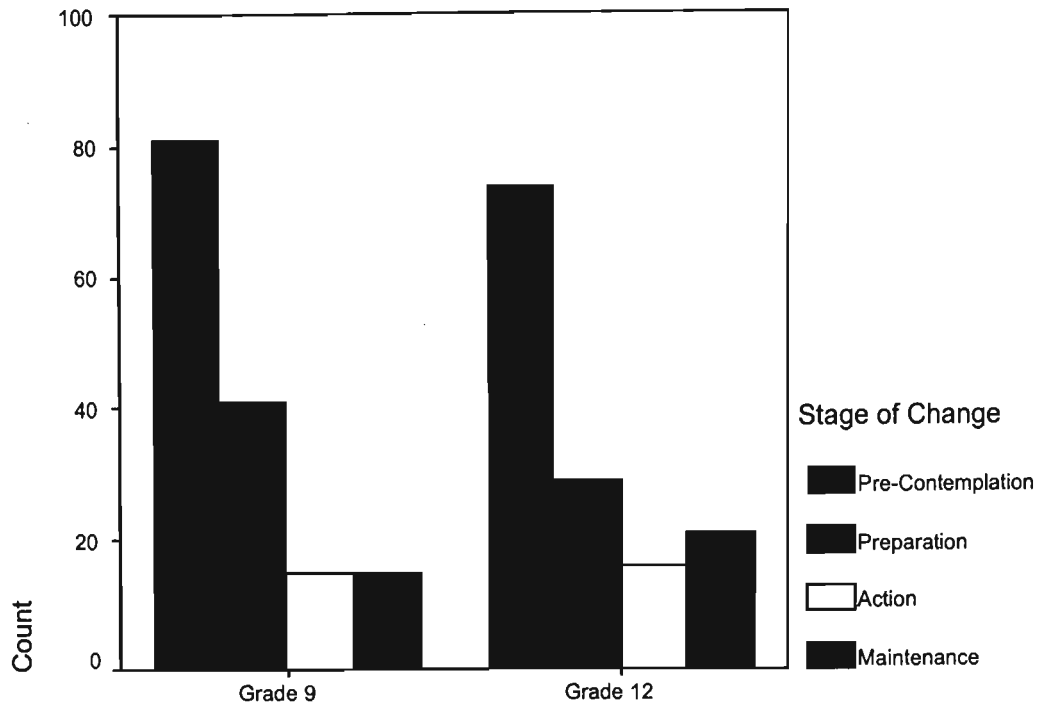


Figure 5: Frequency chart of grade 9 and 12 Stages of Smoking.
The higher relative proportion of maintainers in grade 12 can be seen.

Religion

While the χ^2 statistic suggested a statistically significant relationship between stage and religion ($\chi^2 = 29.011, p < 0.01, \text{Cramer's } V = 0.197$), there were 15 cells with an expected count of less than 5 – which results in a serious violation in the assumption of normality for χ^2 (Howell, 2002). This probably occurred because 211 out of the 248 participants who reported a religion were Christian; therefore the other groups were very small. Using the self-rated extent of religiosity measure, however, a one-way ANOVA found that average religiosity was far higher at a lower stage of change [$F(3) = 25.516, p < 0.001$].

School

There was no significant association between School and Acquisition Stage ($\chi^2 = 11.688$, Cramer's $V = 0.116$, $p = 0.231$) suggesting that of the four sampled schools, none of them had a higher rate of smoking than the others.

Other Associations with Stage²³

Perceived Social Norms

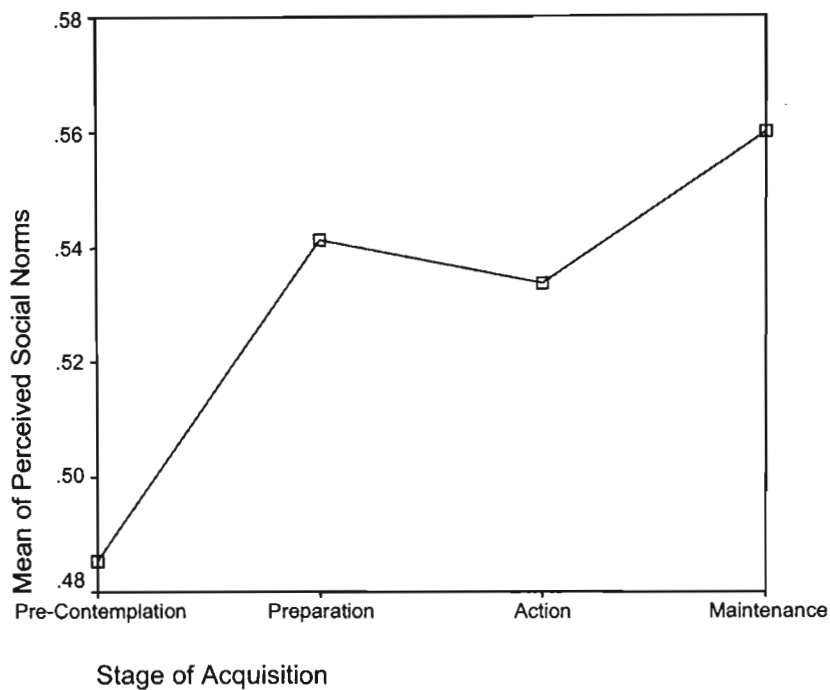


Figure 6: Average score for Perceived Social Norms for each stage.

As hypothesised, the average Perceived Social Norms score differed significantly between the four different stages of acquisition when analysed with a one-way ANOVA [$F(3) = 4.985$,

²³ See Appendix I for details of these analyses.

$p < 0.01$]. Tukey's HSD post hoc testing showed that the Pre-Contemplation group was statistically different from the Preparation ($p < 0.05$) and Maintenance ($p < 0.05$) groups. The sharp increase in perceptions of the positive smoking norm from Pre-Contemplation to the smoking stages can be seen in figure 6 on the previous page. The effect size for this difference is, however, very small ($\omega^2 = 0.043$) and suggests that less than five percent of the difference between stages can be explained by perceived social norms.

Perceived Adult Prevalence

The perceived number of adult smokers out of ten was much the same in each stage of smoking. The average per stage ranged from a perceived 6.00 adult smokers out of ten in the Action stage to 6.92 out of ten in the Preparation stage – not a large difference in practical terms. The one-way ANOVA, therefore, found no significant effect [$F(3) = 9.128, p = 0.075$]. Adolescents in all stages, however, over inflated the percentage of adult smokers which is, in reality, closer to 30% (UNF, n.d.) – a worrying fact when one considers the role of the perceived normative environment in smoking (e.g. Schofield, Pattison and Borland, 2001).

Parental Smoking

Maternal Smoking

Maternal smoking was found to be significantly associated with smoking in females (Cramer's $V = 0.410$, odds ratio = 19.83, $\chi^2 = 25.738, p < 0.001$), but was not significantly associated with smoking in males (Cramer's $V = 0.171, \chi^2 = 3.722, p = 0.309$). Therefore, it appears that having a mother who smokes is a significant risk factor for starting to smoke for

adolescent girls, suggesting that maternal smoking gives girls a 19.83 times greater risk for smoking.

Paternal Smoking

Unlike maternal smoking, the father's smoking practices have little association with adolescent smoking in both boys (Cramer's $V = 0.111$, $\chi^2 = 1.516$, $p = 0.689$) and girls (Cramer's $V = 0.140$, $\chi^2 = 2.921$, $p = 0.419$), suggesting that adolescent smoking occurs (or does not occur) irrespective of the father's smoking practices.

Participant Alcohol Use

Due to violations in the assumption of homogeneity of variances, the Welch procedure was used in favour of one-way ANOVA. Significant differences in the mean number of units of alcohol consumed per week were found between stages [$F(3) = 3.770$, $p < 0.05$, $\omega^2 = 0.115$]. Post hoc tests (Tukey's HSD) found that the average of the Maintenance group was significantly higher than each of the other groups, as is indicated in figure 7 on the following page.

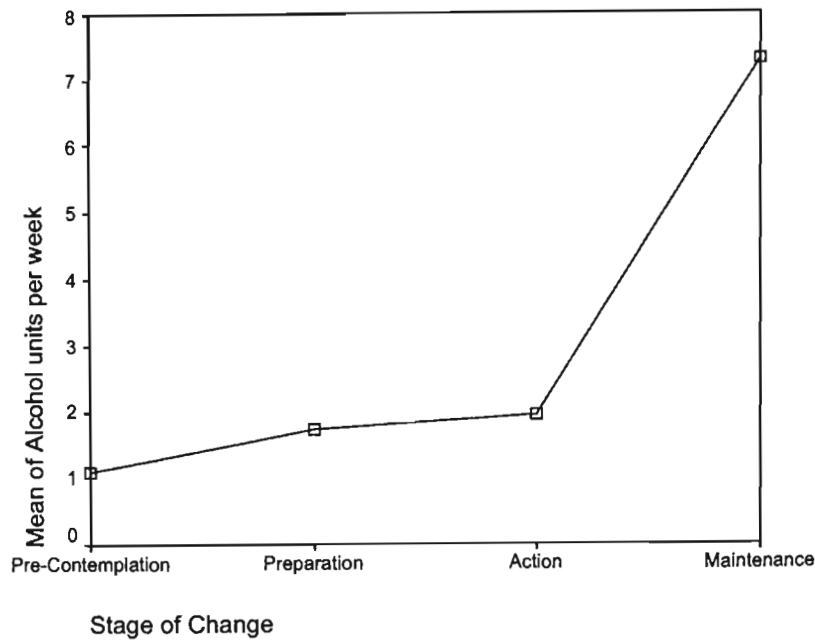


Figure 7: Mean number of units of weekly alcohol consumption for each stage.

Relationship of demographics to Decisional Balance, Temptation and PSN²⁴.

Grade

Those respondents in grade 9 scored significantly higher than grade 12s on certain socially-oriented scales, namely: Social Cons [$F(1) = 6.386, p < 0.05, \omega^2 = 0.018$], Perceived Social Norms [$F(1) = 5.259, p < 0.05, \omega^2 = 0.043$] and the Curiosity-Temptation sub-scale [$F(1) = 9.892, p < 0.01, \omega^2 = 0.011$]. Other measures were not significantly different, although grade 9s scored higher on all scales. Younger adolescents were thus more sensitive to the perceived social risks of smoking, but conversely, also had a higher perception of a

²⁴ See Appendix J for details of these analyses.

social expectation of them to smoke. Not surprisingly (and considering their younger age) they were more tempted by curiosity to smoke.

School

All measures were equal between the different schools, except for the Perceived Social Norms scale [$F(3) = 12.207, p < 0.001, \omega^2 = 0.079$]. Post hoc testing using Tukey's HSD showed that there were three homogenous subsets of schools – that is, the two highest scorers were similar to each other, but different to all others, the two middle scorers were similar to each other but different to all others, and the lowest two scorers were similar to each other but different to all others²⁵. This indicates that the perceived normative expectation on adolescents to smoke can vary according to environmental setting, in this case the school. Nothing further can be said on the matter to protect the confidentiality of the schools in question.

Gender

There were no statistically significant differences between male and female participants on Decisional Balance, Temptation or Perceived Social Norms. Gender does therefore not predict a particular decisional balance or temptation by specific factors to smoke. Past research, however, has found that weight control is a major temptation for young girls to smoke (e.g. Boyd, Boyd and Greenlee, 2003), although this temptation was not investigated in the present study.

²⁵ Differences were significant at the 0.05 level.

Language

There were marked differences between African language- and European language- speakers on many of the sub-scales involved in this analysis. European language speakers scored significantly higher on the Coping Pros [$F(1) = 9.345, p < 0.01$], Pros combined [$F(1) = 6.488, p < 0.05$], Temptation [$F(1) = 12.589, p < 0.001$], Social Situations [$F(1) = 9.485, p < 0.01$], Affect Regulation [$F(1) = 16.960, p < 0.001$] and Boredom [$F(1) = 7.103, p < 0.01$] sub-scales. These differences are summarised in table 5 on the next page. This suggests that Europeans are more likely to decide to smoke on the basis of the perceived stress coping properties of cigarettes than Africans. Europeans are also more tempted to smoke, by a variety of factors, than Africans. This suggests that Europeans are a higher risk group for smoking than Africans.

Robust Tests of Equality of Means

		Statistic(a)	df1	df2	Sig.	ω^2 Effect Size
Social Pros	Welch	1.013	1	261.592	.315	0.000
Coping Pros	Welch	9.345	1	227.532	.003	0.031
Pros	Welch	6.488	1	235.022	.012	0.021
Social Cons	Welch	1.709	1	255.560	.192	0.003
Health Cons	Welch	.004	1	262.983	.951	-0.004
Cons	Welch	.417	1	261.082	.519	-0.002
Perceived Social Norms	Welch	.041	1	247.592	.839	-0.004
Temptation	Welch	12.589	1	217.806	.000	0.045
Social Situations	Welch	9.854	1	232.226	.002	0.033
Affect Regulation	Welch	16.960	1	224.210	.000	0.059
Boredom	Welch	7.103	1	225.232	.008	0.023
Curiosity	Welch	2.232	1	244.493	.136	0.005

a Asymptotically F distributed.

Table 9: Decisional Balance differences and between African and European language speakers:
*African language mean greater than European language mean.

Religion

Violation of the assumption of homogeneity of variances with regards to the Social Situations, Curiosity and Boredom sub-scales resulted in the Welch procedure being used for analysing these three scales in favour of the ANOVA procedure. The various religious groups varied on the following sub-scales: Coping Pros [$F(4) = 3.861, p < 0.01$] where the no-religion group was higher than the Christian group ($p < 0.05$), Pros combined [$F(4) = 3.291, p < 0.05$], where the no-religion group was again higher than the Christian group ($p < 0.05$), Temptation overall [$F(4) = 4.721, p < 0.01$], in which case the no-religion and “other” religion group (including a Rastafarian) were higher than the Christian group ($p < 0.05$), and Affect Regulation [$F(4) = 4.262, p < 0.01$], where the no religion group scored higher than the Hindus and Christians ($p < 0.05$).

DISCUSSION

Summary of Main Findings

In the analysis of differences in Decisional Balance scores across stages it was found that the perceived cons of smoking were high at all stages, and did not decrease as much as expected in later stages of smoking. In fact, when Pros and Cons scores are compared, the cons of smoking are seen to be higher than the pros, even in the Maintenance stage (See figure 2, p. 115.) Only the social cons decreased significantly. Pros of smoking, however, increased drastically with later stages of acquisition. This finding has dire implications for the health promotion field: it seems that knowledge of the dangers of smoking is well disseminated and understood, but has little effect in discouraging smoking (a similar conclusion is reached by Rooney and Murray, 1996). Perceptions of the benefits of smoking, however, have been shown to increase rapidly with later smoking stages. This may imply that, in the battle of messages between the health promotion field and tobacco marketers, the tobacco industry is far more successful. An alternative interpretation may however simply be that adolescents are more inclined to perform risky behaviours than “safe”, health affirming ones.

Findings of stage differences in Temptation show that temptation to smoke increased with a later stage, as did all temptation sub-scales – namely Social Situations, Affect Regulation, Boredom and Curiosity. These findings illustrate the differences between stages with regard to what factors tempt members of each stage to smoke. Figure 2 (p. 115), for example, shows that Pre-Contemplators and Preparers are more tempted to smoke by curiosity, while those in the Action stage are more tempted to smoke in social situations where smoking is common,

and those in the Maintenance stage are most tempted by smoking's affect regulation properties.

Certain demographic variables were associated with stage of acquisition. Speakers of a language of European origin were more likely to be in a later stage than African language speakers. A marked gender difference in smoking stage was also found, where males were far more likely to be in a later stage than females – this difference, however, was present only in the African language sub-group. Certain religion beliefs were associated with certain stages of acquisition: having no religion or a religion other than Christianity, African traditional or Hinduism was associated with a later stage. Christianity was associated with an earlier stage. Those expressing no religious beliefs were thus at a higher risk of smoking than other religious orientations. A higher level of religiosity – that is the level of religious conviction – was in all cases associated with an earlier acquisition stage.

The association of stage of acquisition with a number of other variables was also investigated. The Perceived Social Norms construct showed increased average scores with later stages, as did perceived adult prevalence. Maternal smoking was found to be significantly positively associated with acquisition stage, but only among girls. Paternal smoking was not significantly associated with stage in either males or females. Finally, alcohol usage as measured by self reported numbers of alcohol units consumed per week was positively associated with a later stage of acquisition, and showed a marked increase from the Action to Maintenance stages.

The implication of these findings will be discussed in the following section of this report.

Application of Stage Model in SA

The first aim of the research project was to apply the theory of the TTM to other populations, namely the South African adolescent population, and to investigate the pattern of decisional balance as it applies to smoking acquisition, as well as determining the tempting factors most salient at each stage. This aim involved determining how the TTM constructs of Decisional Balance and Temptation related to Acquisition Stage and whether there were significant differences between stages on the basis of these variables.

The relationship of Stage of Acquisition to Decisional Balance and Temptation provided support for the TTM, and showed how participants in different stages measured differently along these dimensions. The Decisional Balance scale consists broadly of pros of smoking and cons of smoking. As hypothesised, the pros of smoking increased with later stages and the cons of smoking showed a corresponding decrease. This confirms the theoretical basis for the TTM, which is that smoking acquisition progresses through stages and that people's attitudes towards smoking and beliefs about it change predictably in each progressive stage. However, a far more significant result than this perhaps intuitively obvious finding, is the unique pattern of differences between each stage on the Decisional Balance sub-scales. These sub-scales indicate which specific factors, such as Social Pros or Coping Pros, are salient at each stage. Within the Pros scale, the Social Pros sub-scale showed a positive linear increase from stage to stage, as did Coping Pros. Especially significant is that Social and Coping Pros appear to be about equal in influence earlier on in the acquisition process, but Coping Pros became more important in later stages – probably due to the formation of a nicotine dependence at about this stage. This confirms the initial hypotheses about these measures which were based on previous findings (Pallonen, Prochaska, Velicer, Prokhorov and Smith,

1998). These findings are illustrated in figure 1 where the average Social Pros scores are slightly higher than the Coping Pros scores in Pre-Contemplation, but by the Maintenance Stage the pattern has reversed and Coping Pros are significantly higher.

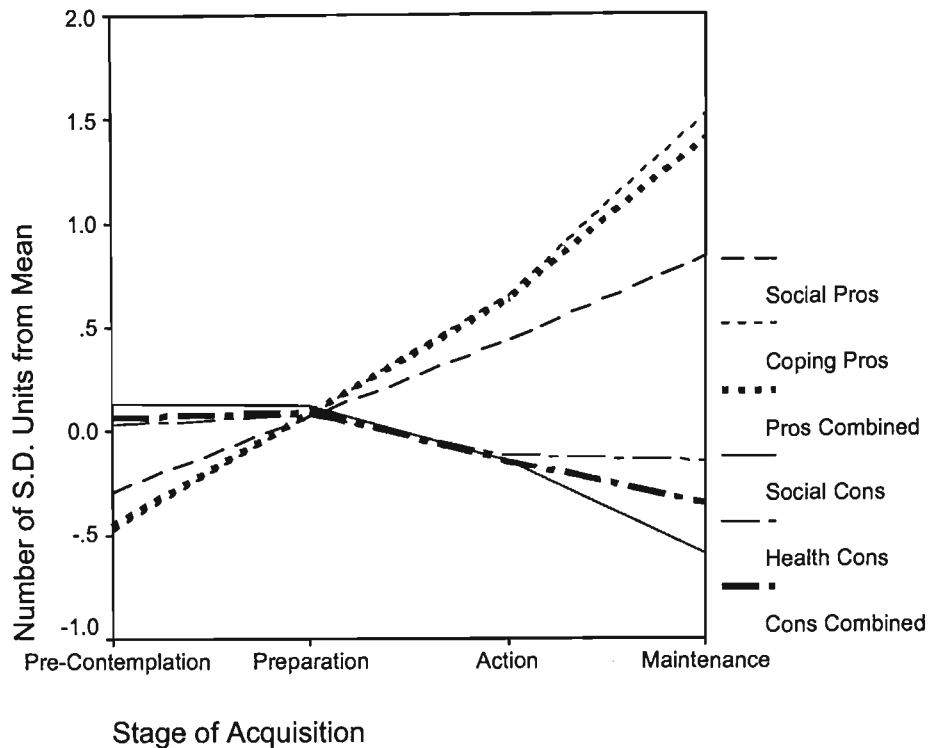


Figure 8: Decisional Balance z-scores by Stage of Acquisition.

Figure 8 above illustrates the average score of each decisional balance sub-scale standardised as a z-score for each stage of acquisition. This figure represents the same information as in figure 1, but the slope of the line in figure 8 gives an indication of the variance of the scale between stages. Two features of this graph are of particular interest. Firstly, that the Pros and Cons interact in the Preparation stage. In the context of figure 8 this means that the Preparation stage represents the pivotal point around which all scores vary. This suggests that a radical change in intentions to smoke and attitudes towards smoking takes place in the time period between Pre-Contemplation (having no intentions to smoke) and Action (having

smoked recently) and Preparation may represent a key stage to reinforce negative smoking attitudes and norms and promote healthy behaviours. This finding confirms previous TTM research which reports that Pros and Cons scores interact between Pre-Contemplation and Action (Prochaska, Johnson and Lee, 1998).

Secondly, the pros of smoking escalate far more than the cons decrease. Only the Social Cons decrease markedly – the cross-stage differences in Cons was only just statistically significant ($p = 0.027$). This suggests that the social – and especially the coping benefits – derived from smoking are far more important in smoking initiation than is the decrease of cons. Health Cons particularly showed no statistical difference from stage to stage, even though the average score for each stage was quite high on this measure (ranging from 78% in Pre-Contemplation to 79% in Preparation – see figure 1, p.113). It may be more effective for prevention interventions to decrease the positive appearance of smoking, such as perceptions of smoking's ability to relax and the positive social perceptions. This finding also suggests that while informative approaches to smoking prevention have successfully increased knowledge and beliefs about the health risks of smoking, they have not succeeded in reducing the progression to later stages of smoking initiation. This was also concluded by meta-analyses of smoking prevention programmes (Bruvold, 1993; Rooney and Murray, 1996). Perhaps a reason for the failure of informational prevention approaches is highlighted by this finding – that the perceived pros of smoking outweigh any perceived health risks (which are probably viewed as remote, both in time and likelihood, by adolescents) in adolescent decisions to smoke. It is probably correct to say for most cases that a saturation of knowledge of health risks of smoking has occurred, and further information is not likely to precipitate any reduction in adolescent smoking.

The Temptation scores, as hypothesised, increased with a later stage of smoking. The pattern for Temptation, Social Situations, Affect Regulation and Boredom was similar, showing a gradual increase from Pre-Contemplation to Action, then a marked increase towards Maintenance. Figure 2 (p. 115) illustrates these patterns. These findings illustrate the phenomenon of regular smokers becoming increasingly dependent on smoking in a wide variety of situations. A physiological dependence on nicotine, therefore (if we can assume those in the Maintenance stage to be nicotine dependent), is not the only phenomenon driving temptation to smoke. From these findings increased smoking can be seen being caused by factors from a variety of dimensions: social, emotional and psychological. The practice of smoking is about more than just obtaining nicotine. This is obvious in the case of many adolescents, who are not dependent on nicotine, but are tempted to smoke by social situations and the perceived psychological and affective benefits of smoking. That these temptations increase with later stages is indicative that the practice of smoking becomes ingrained in a person's repertoire of behaviours and a person becomes addicted to smoking for its functions as a social tool and regulator of affect and psychological states like boredom as much as for a dose of nicotine.

The Curiosity temptation however showed a different pattern of differences to the other subscales, peaking at Preparation and then tapering off towards Maintenance. This phenomenon is probably best explained by the fact that curiosity to smoke is likely to lessen once a few cigarettes have been tried. It is therefore not surprising that those in the Preparation stage (having smoked at least once in the past year, but not in the past month) be the most curious about smoking. These adolescents have formed an intention to smoke, but have not yet satiated their curiosity about smoking.

The implications of these findings for health promoters are that interventions should target these tempting situations at all stages with the aim of decreasing the stage-related increases in Temptation. One possible practice would be aiming to substitute smoking with a more healthy activity for boredom and affect regulation situations and disassociating smoking from these situations.

In conclusion, the Transtheoretical “Stages of Acquisition” Model has been applied in the context of an adolescent South African population and the nature of the association between Decisional Balance, Temptation and the Stages of Acquisition has been explained statistically.

Differences in Stage According to Demographic Variables

Differences in demographic variables according to stage are invaluable as they provide programme designers with salient trends in smoking behaviour and associated risk factors among different demographic groups. This enables programme designers and policymakers to implement relevant preventative interventions that will best address the needs of the target demographic group – the concept of *stage-matched* interventions introduced by the TTM (Prochaska, Johnson and Lee, 1998).

Gender and Language

While the association between acquisition stage and gender suggests that boys are more likely to be in a later stage of smoking than girls ($\chi^2 = 8.086, p < 0.05$), this finding is

moderated by the effect of the language variable. When African and European language speakers are analysed in separate layers the following interaction manifests: no difference exists between European males and females – the association results entirely from the significant difference between African males and females ($\chi^2 = 12.010$, Cramer's $V = 0.286$, $p < 0.01$) where there are significantly more females than males in the Pre-Contemplation stage and significantly more males than females in the Maintenance stage. Among African language speakers, therefore, being female seems to be a protective factor against smoking – a similar finding to that of Flisher, Parry, Evans, Muller and Lombard (2003) who concluded the same about black girls in Cape Town. African language speaking males, however, showed comparable patterns of stage membership to male and female European language speakers.

To conclude, African language speaking males and European language speakers show comparable smoking patterns while African language speaking girls smoke significantly less (odds ratio = 15.4), showing far fewer members in the Maintenance group (see table 5). This may reflect a cultural norm around smoking in African women. It is important to reiterate at this stage that the African – European language dichotomy is not necessarily a black – white division. It is more than likely that all those in the African group are black, but the European language group is probably made up of mixed race groups. It is probably an accurate assumption that those black girls who speak an African language at home are less Westernised than those who speak a European language. This finding, therefore, is that girls of a more traditional African cultural background smoke less than their male counterparts. This difference may not be present between more Westernised black boys and girls. Smoking cigarettes for Westernised black girls may symbolise sophistication and feminine liberation (cf. Boyd, Boyd and Greenlee, 2003). Research into the social meanings of African women's

smoking, especially teasing out the differences (if any) between more traditional African women and the increasing proportion of Westernised African women would therefore be useful to determine the factors behind the male-female difference found here.

Grade

The difference in smoking frequency of grade 9 and grade 12 participants in different stages was not statistically significant. However, as expected, more grade 12s were in later stages which reflects the developmental nature of smoking acquisition. The lack of significant association between grade and stage suggests that both junior and senior high school adolescents can be considered equally vulnerable to smoking and therefore equal attention should be given to both groups in terms of interventions.

Religion

Due to violation in the assumption of normality in the χ^2 test used to analyse the association between religion and stage, it was impossible to draw conclusions about the differences between the Christian, Hindu, African Traditional, None, or Other religious groups. The results gained from this analysis suggested that being a Christian may be a protective factor for smoking, whereas reporting one's religion as *none* may be a risk factor, but due to the small expected frequencies in many of the cells as a result of the large number of cells in the contingency table (5 x 4) and the fact that over half the respondents were Christian, these results should be interpreted with caution. It would have been possible to carry out the analysis by collapsing categories, but the resulting loss of resolution would have made the results meaningless. Intuitively, one would expect members of religious groups – especially

more conservative ones – would be less likely to smoke. This assumption does fit with the present findings which presents a good argument in favour of ignoring the small expected frequencies problem. However, it was decided to limit the analysis to an alternate measure of religion – namely self-reported religiosity. An analysis found a negative association between self-reported levels of religiosity and stage of acquisition. This finding suggests that, particular religious beliefs aside, having a religious belief system that is adhered to is a significant protective factor against acquiring established smoking behaviour. On a scale of 1 to 5 where 1 is the least religious, respondents in Pre-Contemplation or Preparation had an average score of 3.2 and 3.3 respectively, whilst those in Action had a lower score of 2.9 and those in Maintenance an even lower score of 2.3. The implication of this finding for preventative interventions is contentious as the South African legislation prohibits the promotion of religion in the school – likewise offering preventative interventions to some religious groups and not others is unconstitutional.

Other Associations with Stage

Perceived Social Norms

The slight increase of perceptions of the positive social smoking norm from earlier to later stages is indicative of the importance of the normative environment and smoking. However, due to the cross-sectional nature of this study, the causal nature of the relationship is unknown. Normative influences could cause smoking, *vice versa*, or the two could be mutually influencing. It would be useful to conduct a similar investigation on a cohort of high school adolescents over several years where the normative influence is controlled (although

this would be a difficult control to achieve). One possible design would be to compare several schools varying according to their cultural or religious attitudes to smoking in order to determine how different normative environments influence subsequent adolescent smoking. Clearly, though, this design would be fraught with compounding factors as it is unlikely to find two such schools that are similar on other variables and distinguishing between the effects of the normative environment and the effects of parents, peers, institutional policies, access to cigarettes, and so on, would be impossible.

However, if the direction of causality is assumed, and the normative environment is taken to influence smoking (as is well established in the literature review, e.g. Altman and Jackson, 1998; King et al., 2003), then the implications of the present study findings are that negative smoking norms should be enforced and pro-smoking norms undermined in adolescents at all stages of smoking, but especially earlier on when perceptions of the pro-smoking norm are still low.

These findings lend weight to the theoretical advantages of incorporating aspects of the Theory of Planned Behaviour into the TTM – a possibility suggested by Holtgrave, Tinsley and Kay (1995). If changes in smoking stage can be explained in part by varying levels of Perceived Social Norms, then this adds an extra dimension to the TTM – a social normative dimension. Perceptions of the prevailing social norm, and the expectations people believe these norms place on their behaviour, are some of the primary motivating factors to act according to the TPB (Fishbein and Ajzen, 1975, as cited in Pitts, 1996). This social dimension, therefore, adds weight to the TTM and overcomes the criticism that the TTM ignores social factors in its decision-making model of behaviour change (Marks, Murray, Evans and Willig, 2000). Alternatively, this finding points to the possibility of a TPB

superiority to the TTM in explaining health risk behaviour – a conclusion reached by Armitage and Arden (2002) in their research on the matter.

Perceived Prevalence

It was an interesting finding that the perceived adult prevalence was constant across stages, and was rather high (the average respondent thought between 60 and 69% of adults smoked – the actual figure is closer to one-third [UNF, *n.d.*]). In light of the influence of perceived social norms on smoking uptake, one would expect perceived adult prevalence to have a similar influence. However, the perception of the number of adult smokers is constant across stages. This finding can be explained in two ways. Firstly, the Perceived Social Norms construct and perceived adult prevalence constructs are not the same – although related. Perceived Social Norms refers to the perception of what is expected of respondents with regards to smoking by significant people in their lives (parents, friends, and so on). On the other hand, perceived adult prevalence refers to the number of adults they think smoke (who may not necessarily define the participants' normative environment). The second reason is related to this point – while all participants view smoking common in adults, adulthood is viewed here as a distant phenomenon, which is completely external to them and their lives. Consequently, this perception has little impact on their decision to smoke or not.

Parental Smoking

Maternal smoking was found to be strongly positively associated with stage of smoking in girls, but not in boys. Paternal smoking had no significant effect on either boys or girls. This replicates the findings of Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura

(2002) who found, in a longitudinal study, that maternal smoking increases the likelihood of smoking by 36% in girls. The implication of this finding for interventions is that girls should be inoculated against the effect of maternal smoking. However, the precise mechanism responsible for this relationship is unknown; perhaps this finding indicates the salience of the mother in child rearing, or perhaps could be explained by the mother-daughter bond or degree of connectedness (Lloyd-Richardson, Papandonatos, Kazura, Stanton, Niaura, 2002).

Additional research is therefore needed to investigate the nature of the mother-daughter relationship and its effect on smoking before preventative interventions can properly prevent the negative influence of maternal smoking on girls. Based on findings by Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura (2002), who also found family connectedness to be a mildly protective factor, the interactive effect of maternal smoking and family connectedness should be investigated. The further implications of this finding are that preventive interventions need to target multiple social levels – both the school and family environments, as suggested by Werch and DiClemente (1994). Such a powerful influence cannot be ignored and parents should be encouraged in the first instance to quit smoking themselves and, secondly, to be aware of the effect their smoking has on their children.

Participant Alcohol Use

Alcohol use was significantly associated with increased levels of smoking, especially in the Maintenance stage. This association is well established in the literature (e.g. Flisher, Parry, Evans, Muller and Lombard, 2003); however, the nature of the relationship between smoking and alcohol use is probably not a directly causal one. It is likely that multiple common factors influence both practices. Smoking prevention programmes could therefore be delivered simultaneously with alcohol abuse prevention programmes due to their high co-occurrence.

Relationship of demographics to Decisional Balance, Temptation and PSN.

Grade

While it was found that grade 9s and grade 12s do not differ significantly in terms of acquisition stage, they are different on certain sub-scales: the Social Cons sub-scale, the Curiosity sub-scale and the Perceived Social Norms scale – where grade 9s scored consistently higher than grade 12s. This suggests that while the two age groups do not differ much in terms of levels of smoking behaviour and attitudes towards smoking, there are different factors that influence these behaviours and attitudes at different grades. That grade 9s are tempted to smoke by curiosity more than grade 12s are is no startling finding. It probably results from the younger adolescents' lesser exposure to cigarettes and smoking, especially among their peers. This finding complements the higher grade 9 score on Perceived Social Norms – suggesting that younger participants seem to be more vigilant to social cues to smoke, possibly as a result of, or possibly causing their curiosity. In addition to being more sensitive to the positive social norms of smoking, younger respondents were also more sensitive to the Social Cons of smoking – believing more than grade 12s that smokers have weak character, smoking is embarrassing, and that it bothers others (see items Q15 – Q17, Appendix D). Overall, one can infer from this that younger adolescents are more sensitive to social cues to smoke, and preventative interventions should focus on promoting the anti-smoking norm thereby playing on their already-present perceptions of the social cons of smoking. However, findings that Coping Pros rather than Social Pros are more significant at later stages of smoking (*present study*; Pallonen, Prochaska, Velicer, Prokhorov and Smith, 1998) suggest that inoculating younger adolescents against belief in the coping benefits of smoking should also be a priority.

School

The difference between schools on the Perceived Social Norms scale (the lowest scoring school was different to the two highest, the second lowest to the highest, the second highest to the lowest, and the highest scoring school to the two lowest scoring schools²⁶) indicates one important thing: different environments have different norms around smoking which can be interpreted as pro-smoking or anti-smoking by adolescents. Since the role of the environment is hugely important in smoking acquisition (especially since Perceived Social Norms is positively associated with a later stage in smoking), the school an adolescent finds him/herself at – and the peers with whom he/she associates – can play a significant role in their smoking behaviour. It is no coincidence, then, that in this study the two schools with the highest proportion of students in later stages of acquisition were the same two schools that had the highest average Perceived Social Norms scores.

Gender

As there were no significant differences between male and female participants on Decisional Balance, Temptation or Perceived Social Norms, it can be concluded that both sexes are influenced to smoke by similar factors. However, it must be remembered that girls are significantly more influenced by their mothers' smoking than boys are, so it cannot be concluded that smoking initiation is identical in both boys and girls. Furthermore, there is evidence that weight control is a significant influence in female smoking uptake (Boyd et al., 2003), which is a variable not measured in this study.

²⁶ See Appendix J

Language

European language speakers scored significantly higher than African home language speakers on the Coping Pros, Pros combined, Temptation, Social Situations, Affect Regulation and Boredom scales. This pattern suggests that smoking may take on different social meaning and significance in people of different cultural backgrounds. From the pattern of higher Coping Pros, Affect Regulation and Temptation, it could be concluded that European language speakers tend to smoke for the anxiolytic, affect management properties (real or perceived) of cigarette smoking, while this tendency is not present in African language speakers. Based on the present study, it would seem that African language speakers are initiated into smoking more for social reasons, and are not tempted to smoke in order to cope with stress. From these findings it would be interesting to see whether European language speakers have a higher rate of nicotine addiction than African language speaking smokers (when controlling for the relative number of smokers in each group). This would provide confirmatory evidence of whether European language speakers are at a greater risk of moving on from experimentation to sustained, addiction-driven smoking. The finding of this study that shows that more European language speakers than African language speakers are in a later stage of acquisition already suggests this.

Another question arises from this finding: are the factors that influence the uptake of smoking different for these two language groups? And, a related question, do the TTM constructs present a valid account of the factors involved for both language groups? The finding that European language speakers score so much higher than African language speakers on a number of sub-scales raises the question as to whether those sub-scales are relevant to the African language speaking population. These two questions could be answered by qualitative

research investigating the difference in meaning and the functions smoking has for these various groups.

Religion

The differences between religious groups on Coping Pros, Pros, Temptation and Affect Regulation – where the differences were largely between those respondents who expressed religious group membership and those who declared to have none (who had the higher scores) – suggest, once again, that membership of any religious group is a protective factor against smoking.

Summary of Findings

Findings that the stage of acquisition construct relates to varying measures of Decisional Balance, Temptation and Perceived Social Norms for each stage suggests that TTM is applicable in the South African context in as much as it illustrates different levels of smoking behaviour and attitudes to smoking in each successive stage. However, the lower score of African language speakers on several of the TTM sub-scales raises the question as to the cross-cultural validity of the TTM. Perhaps the factors involved in the acquisition of smoking in Western adolescent populations are not the same as those involved in smoking in the context of Africa. This has already been discussed to some extent with regard to the potential differences between Westernised and traditional black girls in smoking. Perhaps the process of smoking acquisition in African populations would be better explained by a model other

than the TTM – or perhaps the TTM variables implicated in driven change could be adapted for this context.

Differences in smoking stage due to language and gender suggest that African language-speaking females have a far lower risk of smoking than other groups, and that European language speakers are particularly at risk, possibly due to a greater propensity to smoke in order to cope with negative affect. Particular attention should be paid to preventing perceptions of the coping properties of smoking, especially in European language speakers.

Another salient finding to do with gender differences was that maternal smoking affects girls far more than boys and that paternal smoking has little effect on either. The clear implications for preventive interventions are firstly to persuade mothers to stop smoking due to the effect it has on their daughters and secondly to inoculate girls against the influence of maternal smoking.

Smoking stage was also affected by religion – the results of the analyses pointing to, not specific religions as risk factors, but rather to having religious beliefs that were strictly observed as being a protective factor against smoking. However, certain ethical dilemmas arise if health promotions are to promote religion to prevent smoking uptake, such as which religions are to be promoted and how members of other religious groups will react to this. Nevertheless, it remains that religious conviction is a protective factor across all religions.

The social environment emerged as a significant factor in the smoking uptake process. This is indicated by the increase of perceptions of positive smoking norms with later stages of acquisition. However, the higher perception of this smoking norm in grade 9s suggests that

smoking may be about fitting in – with younger adolescents, but play a different function later on – such as affect regulation. This assertion is supported by the finding that grade 9s are more influenced by social cons and suggests that prevention programmes should focus on social aspects of smoking in grade 9s.

To conclude, this study has realised the major aim of finding stage-specific prevalence rates of smoking for different demographic groups, and determining how different stages of smoking differ on various TTM constructs, Perceived Social Norms and various demographic variables. As planned, this data will be useful in designing stage-matched intervention to prevent smoking among adolescents and promote good health.

Implications for Health Promotion

The findings of this study have implications for reducing the incidence of smoking in adolescents. Much research has focused on the most effective means preventing people from starting to smoke (e.g. Bruvold, 1993; Rooney and Murray, 1996) and findings from these studies have been incorporated in policies which have been implemented in a wide range of settings from national legislation to institutional policy (Orlandi and Dalton, 1998). Large health organisations, such as the Centers for Disease Control and Prevention (CDC, 1994; 1999; Task Force on Community Preventive Services, 2001), have interpreted research findings into such recommended policies and practices. The CDC (1994) has published a paper of recommended best practices for schools to prevent adolescent smoking acquisition. Therefore the findings of this research have potential implications for health intervention programme designers and policymakers. These findings are similar to some of the research

findings informing the CDC (1994) school policies and therefore could be incorporated into a similar programme.

To further discuss the implications of this research for health promotion, it may be useful to briefly outline the CDC (1999) recommendations for global control of tobacco use. Their approach to tobacco control is to intervene globally at all levels and through a variety of channels (cf. Orlandi and Dalton, 1998) with the central aims of reducing adolescent acquisition, promoting pro-health behaviours among smokers like quitting, and controlling the exposure to environmental tobacco smoke. Reaching these aims entails tailoring interventions to suit the needs of disparate populations (as suggested by the TTM, Prochaska, Johnson and Lee, 1998), use-reduction programmes aimed at the school and community, counter-marketing campaigns through the mass media, and the provision of cessation and chronic disease programmes to reduce illness (CDC, 1999). The necessity for a globally oriented prevention programme (or programmes) is highlighted in past research by findings indicating the importance of the normative environment, parental influences, peer and teacher influences and the mass media on adolescent smoking uptake. The present research project also indicates the need for global prevention strategies in findings that a) maternal smoking is a significant factor in female adolescent smoking acquisition, b) in the significant increase of Social Pros and Social Temptations with smoking stage which indicates a substantial peer influence in acquisition and, c) in the notable differences in Perceived Social Norms between acquisition stages.

The maternal influence on smoking suggests that preventing adolescent smoking requires collaboration between the school and the home. A preventive message provided at school is likely to be lost if a contrary influence is present at home. The role of perceptions of social

benefits to smoking (Social Pros) and the temptation to smoke in social situations is indicative of the peer influence in adolescent smoking acquisition. The implications of these findings are that adolescents should receive training in social skills and resisting peer pressure to smoke (Bruvold, 1993). The increase in the Perceived Social Norms measure with later stages could indicate a number of possibilities. Firstly, it could be interpreted as more advanced smokers being more susceptible to pro-smoking messages from the mass media or peers (cf. Hu, 1998; Pierce, Choi, Gilpin, Farkas and Berry, 1998). Alternatively, this finding could point to the possibility that a greater exposure to pro-smoking norms increases the likelihood of smoking, as found by Leventhal and Cleary (1980). In either instance, the implications are for preventive implications to target the sources of the pro-smoking messages – the mass media, tobacco marketing strategies, peer beliefs, and so on – to reduce the impact of the pro-smoking norm on adolescent smoking. Bruvold (1993), after a comprehensive meta-analysis of smoking prevention programmes, also stressed the importance of reducing the impact of the pro-smoking norm on adolescents: “Interventions directed at adolescent smoking, then, should carefully assess primary behavioural, normative, and control beliefs held by the target group and then move forwards with educational exercises specifically designed to substantially modify these beliefs and the attitudes, norms, and perceived controls they produce” (Bruvold, 1993, p. 878).

The findings of this study link in well with the CDC (1994) recommendations for school-based prevention programmes to prevent adolescent tobacco use. The recommendations involve establishing a clear anti-smoking policy within the school that applies to students and staff alike. Parrott (1998) suggests that a school policy that is not adhered to by staff members can be even more counterproductive than having no policy at all. Furthermore, the CDC (1994) suggests incorporating regular instruction on the negative social and

psychological consequences of smoking, not merely the well-publicised physical health risks. This education should focus on children of all ages, but especially those in their early teens. For maximum effectiveness, the CDC (1994) recommends establishing links with the community and parents of adolescents to put up a unified front against adolescent smoking. This should include, as suggested above, supportive structures for the cessation efforts of staff and parents who are smokers.

It is clear from the above discussion that there is a need for research informing preventive smoking interventions, especially among adolescents and in schools. Previous programmes have met with varying degrees of success, but interventions with a social normative approach show a clear advantage (Bruvold, 1993; Rooney and Murray, 1996) as do those that attempt to match the intervention approach to the smoking stage of the participants (Werch and DiClemente, 1994). The findings of this research project have illustrated clear differences between acquisition stages, including differences in Perceived Social Norms, and will therefore hopefully provide a useful basis for adolescent smoking prevention interventions.

Criticisms of this study

This study has a number of practical and methodological limitations that have prevented a more thorough treatment of the research aims. These limitations can be divided into methodological and theoretical problems which will be discussed in turn.

Methodological Problems

Sampling limitations

Since the sample was drawn exclusively from four urban, former “White” schools, the generalisability of the findings is limited to urban, well-resourced schools. This is quite a serious lack of generalisability as schools of this kind make up a relatively small proportion of schools in KwaZulu-Natal. Ideally, the sample should have included rural schools, and those formerly less well-resourced under the former government. As well as not representing all schools, the sample size also proved to be insufficient for some of the planned statistical comparisons. While not small ($N = 292$), a comparison of various scores between different religious groups using ANOVA proved unreliable due to the vast majority of the sample belonging to one religious group. The result of this was very small group membership in certain religious groups which affected the normality and homogeneity of variance assumptions of the ANOVA technique. Reliable claims about differences between religious groups could therefore not be made. The predominance of the Christian religion may also relate to the population sampled, as most former “White” schools were also Christian-based institutions.

Another potential problem in the design was the lack of random sampling. The schools were purposively chosen to select what appeared to be a representative stratification of demographic groups amongst urban former model-C schools. Furthermore, the selection of students within each school was left at the discretion of the facilitator implementing the questionnaire, who selected one class from each grade. As classes are streamed, it is quite possible that students in one class would be very different in their smoking practices to those in another. Also, the facilitator’s choice of class may have been based on class attributes that

might affect the results of the study, such as willingness to co-operate or likelihood to be smokers. All these factors may have compounded the study findings. However, this sampling strategy represented the best practical compromise as teachers' busy schedules and other restrictions (such as timetable factors, etc) prevent them from randomly selecting classes.

Limitations due to Cross-sectional design

Pragmatic time limitations on the study regrettably prevented the idealised longitudinal design and a cross-sectional design was used instead. The major problem with the cross-sectional design in this case is that a static design was used to study a developmental – and therefore temporal – phenomenon. As a result, it is impossible to determine the causal relationship between stages and other variables. For example, while the Pros of smoking scale was established as uniformly increasing with a “later” stage of acquisition, it is impossible to determine from this design whether the increase in pros preceded the stage transition or occurred as a result of it. A similar limitation is that the progressive sequence of the stages from Pre-Contemplation to Maintenance is, in this study, assumed – whether the smoking acquisition process proceeds in a linear fashion through these stages, moves in a cyclical pattern of progression and regression as suggested by Prochaska, DiClemente and Norcross (1992), or jumps from stage to stage cannot be determined. More detailed research questions could also have been asked using a longitudinal design, such as that used by Lloyd-Richardson, Papandonatos, Kazura, Stanton and Niaura (2002), who were able to examine the factors that caused specific stage-transitions rather than merely having different scores associated with various stages. Findings of this nature would be very useful in designing preventive interventions as the specific causal factors promoting stage transitions could be

targeted. Replicating the present study using a four- or five- year longitudinal design would thus prove invaluable.

Limitations due to self-reports of behaviour

The use of a self-report questionnaire in measuring what are quite personal attributes also poses some possible problems. It is possible that the demand characteristics of the situation (with the possibility of peers or teachers seeing a participant's answers) could have affected the truthfulness of the answers obtained from the sample. Furthermore, the issue of social desirability cannot be ignored. Those who proudly identify themselves as smokers may be inclined to exaggerate their smoking frequency and pro-smoking attitudes (as is evidenced by one participant who claimed to have smoked 100 000 cigarettes in the past year!). On the other hand, those fearing disapproval in the event that teachers found out about their smoking or those who wanted to appeal to the (perceived) attitudes of the researcher, would be likely to under-report their smoking and pro-smoking sentiments. However, the pragmatic difficulties associated with measuring smoking frequency using biological measures, or individually interviewing every participant individually to increase perceived confidentiality, would be immense. There is also research suggesting that using self-report questionnaires to measure adolescent smoking is a valid strategy that produces reliable results (Aveyard, Lancashire, Almond and Cheng, 2002; Velicer, Prochaska, Rossi and Snow, 1992).

The problem of Type I statistical error

The data analysis is also not without problems. Owing to the number of comparisons being made there is a very high type I error rate. This is excluding multiple comparisons made

within each one-way ANOVA as these the procedure used (Tukey's HSD) controls for the familywise error rate (Howell, 2002). However, it remains that a large number of statistical tests have been performed – one for every comparison between each TTM sub-scale and each stage, between every TTM sub-scale and demographic variable, and between every stage and demographic variable – in other words more than 80 comparisons. This means that should an extreme sample have been drawn from the school population it is almost certain that statistically significant differences would have been found that do not, in fact, exist²⁷. A better means of analysis would perhaps have been to use a factorial ANOVA in place of multiple one-way ANOVAs, but this would not have solved the problem. One factorial ANOVA would have had to be run for every dependent variable – in other words for each TTM sub-scale – more than 25 comparisons²⁸, and the χ^2 analyses run to determine the relationship between demographic variables and stage would have had to be run separately anyway.

There is no one statistical technique that could be used to answer all the research questions raised in this study simultaneously – therefore the fact that type I errors will be made is unavoidable. There is one practical reason, however, for using one way ANOVA in favour of a factorial model, and that is that SPSS does not allow for the robust Welch procedure in the General Linear Model option. As this correction was used extensively to compensate for violations of the homogeneity of variance assumption, using a factorial design would have proved tricky in SPSS and possibly given rise to spurious findings.

²⁷ The familywise error rate for 80 comparisons would be over 98% when $\alpha = 0.05$ – almost a certainty. However, at $\alpha = 0.01$ the error rate drops to about 55% - far more acceptable for the number of comparisons. It should be noted that the majority of significant differences had less than a 0.01 probability, which does substantially reduce the probability of a type I error.

²⁸ Twenty-five comparisons gives a familywise error rate of 72% and 22% at $\alpha = 0.05$ and 0.01 respectively.

A general admonition arises from this discussion: statistically significant findings should be interpreted with caution in this study – but, then, this warning applies to any statistical inferences. However, the majority of findings confirmed *a priori* hypotheses based on previous research, which suggests that anomalous findings due to type I errors are minimal.

Theoretical Problems

A Rational model for an irrational behaviour?

A significant theoretical criticism of this study would be the manifest lack of fit between the Transtheoretical Model of behaviour change, which assumes rational decision making as the basis for all behaviour, and the phenomenon of smoking acquisition which, as most smokers will confess, is not an activity they began through a conscious decision-making process. The TTM originated – and its constructs were developed – in the context of changing problem behaviours. In this case there is a strong tendency to regress towards the Pre-contemplation stage, and the individual must struggle intentionally against this tendency in order to change. Smoking acquisition, however, shows the opposite trend. There is a strong tendency to move towards the maintenance stage (caused by the subtle and subversive pressures to smoke from peers, tobacco marketing and social norms) and, if anything, the decision-making process involved in acquisition occurs in deciding *not* to smoke.

The subtle and non-deliberate nature of smoking acquisition is well documented in the literature review. Some of the major factors in smoking uptake are social or contextual, the influence of which are often not explicitly realised by individuals. Furthermore, smoking is often not the end goal of a person's reasons for starting to smoke, but represents an

instrumental means to a different end (such as an attempt to fit in socially). This suggests that perhaps the TTM makes fundamentally flawed assumptions about the nature of smoking acquisition.

The lack of fit between the TTM and smoking acquisition is further suggested by the decisional balance findings of this study. Figure 1 (p. 115) illustrates that the perceived cons of smoking are higher than the perceived pros at all stages of change. This suggests that any decisions made to smoke are thus either irrational (as one would expect the pros to outweigh the cons for a person to take that course of action) or that a person's smoking is not the result of a conscious decision at all but of more subtle influences. Also, it was found that many respondents who said that they had smoked recently (thus classifying themselves as members of the Action or Maintenance stages) expressed no intention to smoke, either now or in the future, suggesting that smoking occurs by a means other than a rational decision.

There are, however, some responses to these criticisms in defence of the usefulness of the TTM in the context of smoking acquisition. The model may have been designed in the context of rational decision-making, but the constructs of decisional balance, temptation and self-efficacy are nevertheless established factors in smoking acquisition. Starting smoking is undoubtedly related to levels of self-efficacy and intensity of temptations, and this study has shown how various temptations are related to smoking acquisition stages. Furthermore, even though the perceived cons of smoking were constant across stages, the perceived pros varied, indicating the kinds of positive smoking perceptions that motivated smoking. Even if the pros and cons are not causal factors in smoking, the decisional balance of an individual does give a fairly reliable indication of stage membership, suggesting that the TTM is not devoid of predictive power in determining levels of smoking acquisition.

Alternatively, the apparent lack of influence with regards to perceived cons could be explained by the perceived levels of susceptibility to the negative health risks of smoking, and the amount of time before those risks manifest. Perhaps adolescents are aware of the health cons of smoking, but do not act on them as they do not feel personally vulnerable or feel that the threat is too temporally distant to be of immediate concern. The perceived benefits, on the other hand, are immediately rewarding and are thus weighted more heavily than the cons. Perhaps combining the decisional balance measure with perceived susceptibility measures would provide a more realistic explanation of these acquisition processes.

There are also good practical reasons for the use of the TTM in smoking acquisition pertaining to the design of stage-matched interventions. This case is well stated by Werch and DiClemente (1994), who argue that smoking prevention interventions designed to match the decisional balance, self-efficacy and temptation levels of smokers in different stages will produce far more effective results than generic interventions.

Circular reasoning

Part of this study involves the analysis of differences between pros and cons of smoking between stages. It could be argued that the hypothesis that pros of smoking will increase and cons of smoking will decrease with later stages is a circular argument because it seems intuitively obvious that smokers should view smoking as more positive and less negative than non-smokers, and *vice versa*. A similar criticism could be made about the hypothesised increase in Temptation with later stages. Some critics might wonder, therefore, why these comparisons should be made. The importance of these analyses lies, not so much in

determining *whether* these constructs change as hypothesised, but *how much* and *at what stage* do they increase/decrease? Prochaska, Johnson and Lee (1998), for example, illustrate a number of different patterns for decisional balance – the relative weighting of pros and cons – that occur for different health behaviours. For example, for smoking cessation in adults, these authors found that cons outweighed pros in Pre-contemplation, cons were lower in Action than in Contemplation, and that pros were higher than cons in Action. The decisional balance pattern found for other behaviours (for example, weight loss or condom use) were different.

If different health behaviours produce unique patterns of decisional balance, it stands to reason that the decisional balance pattern for smoking acquisition will be different to smoking cessation. Otake and Shimai (2001), who researched adolescent smoking acquisition, found a pattern of decisional balance where the pros of smoking were marginally lower than the cons in Pre-Contemplation, but were higher in each subsequent stage. These authors suggest that patterns of decisional balance should be investigated in various other populations in order to determine how the process occurs in a variety of contexts. Findings of the present study, therefore, aimed to investigate the differences between stages on decisional balance; and found a pattern of pros and cons substantially different to those found by Otake and Shimai (2001) – see figure 1. This indicates that the cross-stage differences in decisional balance are *not* intuitively obvious and the findings do not arise from circular reasoning. Similarly, finding the cross-stage differences in Temptation is needed to determine what tempting factors motivate South African adolescents to smoke, and at which stages these factors are important.

The omission of the Self-Efficacy construct

A core construct implicated in behaviour change by the TTM (Prochaska and DiClemente, 1983) is that of *self-efficacy*. Self-efficacy refers to the level of perceived confidence an individual has to carry out a behaviour changing action (Prochaska, Johnson and Lee, 1998), and has been described by the authors of the TTM (Velicer, Prochaska, Fava, Norman and Redding, n.d.) and in other research findings (e.g. Otake and Shimai, 2001) as being the reciprocal of the Temptation construct. For this reason, the self-efficacy construct was omitted from this study in favour of the temptation construct. However, the relationship between self-efficacy and temptation may not necessarily be that simple – especially not in the South African context, in which the TTM has not previously been applied. In retrospect, it would have been of interest and theoretical value to take a measure of self-efficacy, as well as decisional balance, temptation and perceived social norms, to see how this construct related to the other constructs and differed across stages. Perhaps further research will explore this possibility.

Confounded constructs

This study could also be criticised on the basis of the constructs of investigation not being clearly defined. There is a rather unclear boundary between, for example, the social situations temptation sub-scale, the perceived social pros of smoking sub-scale, and the perceived social norms scale. Temptations to smoke in a social situation are surely very similar to the perceived social benefits of smoking and again to the perceptions of the social norms governing smoking. Similarly, the affect regulation temptation is a similar construct to the coping pros construct. The similar nature of these variables suggests that perhaps some of

them are redundant and the constructs are measuring the same phenomenon but calling it by a different name. There is a worrying degree of similarity in the pattern of social pros and social situations across stages, as well as coping pros and affect regulation (as a glance at figures 1 and 2 will illustrate). It is possible that this confusion resulted from the poor construction of the questionnaire items, which were made specifically for this study.

Recommendations for Future Research

Research is needed to determine the reasons for the differences between male and female African language speakers in smoking stage. Differences are likely to be socio-cultural as a corresponding difference between male and female European language speakers does not exist, and therefore a study of social meanings around smoking would be relevant. Although it cannot be determined from the results of this study, it is likely that some black girls speak a European language at home and others an African language. This suggests that it is possibly a difference in traditional African and a more Westernised culture that accounts for the difference between African and European language speaking girls, and a research project should investigate this.

The reasons for the powerful maternal influence on daughter smoking should also be investigated considering factors such as levels of family connectedness.

With regards to the TTM, findings suggest that there may be a relationship between the stages of acquisition and the Perceived Social Norms construct. This lends support to the theory that the TTM and Theory of Planned Behaviour could complement each other in

explaining smoking acquisition (Holtgrave, Tinsley and Kay, 1995). Additional research should explore this possibility in a variety of samples and in more detail, using a more precise measure of perceptions of social norms than the scale developed for this project.

The *psychological processes of change* (Prochaska, Johnson and Lee, 1998), which have received much attention in the TTM in the context of smoking cessation, were not included in this study for the reason that these processes were manifestly involved in *quitting* problem behaviour and not *acquiring* it. However, in retrospect, some of these processes, such as stimulus control, dramatic relief or contingency management, may well play a role in the acquisition of smoking. Future research could investigate the relationship between the processes of change and stages of acquisition, as these findings may provide insight into the factors promoting (and hindering) stage transitions.

Further research also needs to be done to determine the extent to which smoking acquisition is a result of rational decision-making processes (as the TTM assumes). The literature suggests that much of smoking uptake is caused by the subversive influence of tobacco marketing and peer influences which do not involve rational decision-making. Certainly the TTM in itself is not an adequate model to describe the complex processes of smoking uptake and requires other explanatory constructs (such as perceived social norms) – it assumes all other factors act through the cognitive and psychological processes of the individual (Velicer, Prochaska, Fava, Norman and Redding, n.d.). The potential for combining the TTM with other models of smoking acquisition (such as Social Cognitive Theory, the Ecological Model and the TPB) should therefore be researched.

This study needs to be replicated on a larger, more representative sample of schools and scholars using a longitudinal design. This will enable greater generalisability of the findings and permit the inference of causal relationships between variables and stage of change. This will also help determine the extent to which smoking acquisition is influenced by decision-making processes (as operationalised by decisional balance).

CONCLUSION

This study has applied the Transtheoretical Model of behaviour change to the process of smoking acquisition in South African adolescents in four high schools. The reason for the research was to investigate the factors affecting smoking to inform stage-matched smoking prevention and harm reduction interventions, and to investigate the theoretical gains to the TTM by adding a measure of perceived social norms to the model.

While this study and studies like it are needed to inform school-based or community-based interventions, it is unlikely that these interventions will single-handedly win the war on smoking. While they are of immense value in helping individuals to quit smoking or provide them with the tools to choose not to smoke, they are merely foot soldiers in a war fought with weapons of mass destruction. Rooney and Murray (1996) suggest that the gains from school-based interventions have yielded only minimal effects. The reason for this is that they deal with the mediating and not the primary causes of tobacco use – big business and tobacco industry marketing. As Hastings, MacFayden and Eadie (1999) state: “The tobacco industry is to lung cancer what the mosquito is to malaria” (*web page*). The war on smoking will thus be won or lost at the highest levels – involving governmental policy and multinational organisations. Gilmore and McKee (2002) describe tobacco control policy as a tension between public health on one hand and free trade laws on the other. Unfortunately, the debate becomes one with less humanitarian but more mercenary concerns. Consequently, as the tobacco industry has enormous amounts of money and substantial political power, effective legislation controlling tobacco production and distribution is difficult. For example, in the 1990s the European Union spent less than a fifth of a percent on smoking prevention than on

subsidies to tobacco producers (Gilmore and McKee, 2002). Sadly, big business is more highly valued than human life.

The problem is, however, hugely complex – far more so than this brief discussion has suggested – and involves issues of free-trade, individual choice, and political power.

However, perhaps the multinational venture undertaken by the World Health Organisation, the Framework Convention for Tobacco Control (WHO, 2003), aimed at providing the international co-operation needed to control tobacco production, distribution and product manufacturing, will gain valuable ground. In the meantime, however, community- and school-based smoking programmes should continue to do what they can.

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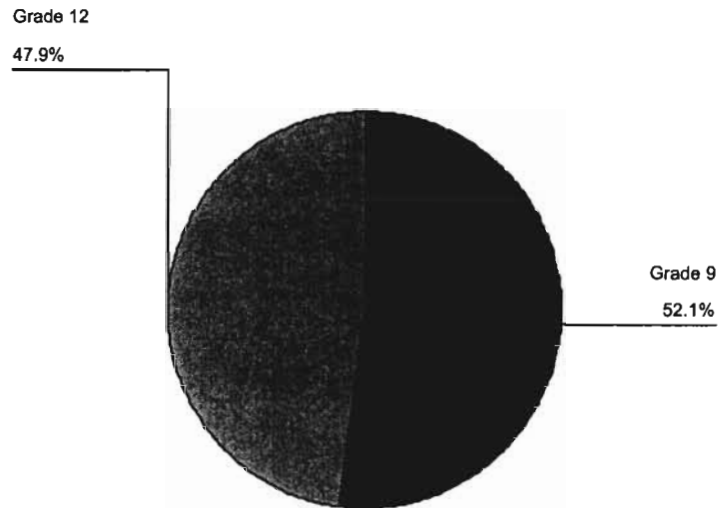
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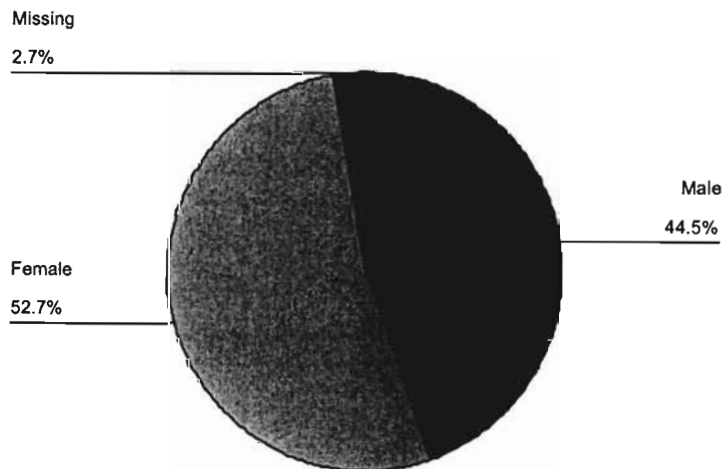
APPENDICES

Appendix A – Demographic Information of Respondents

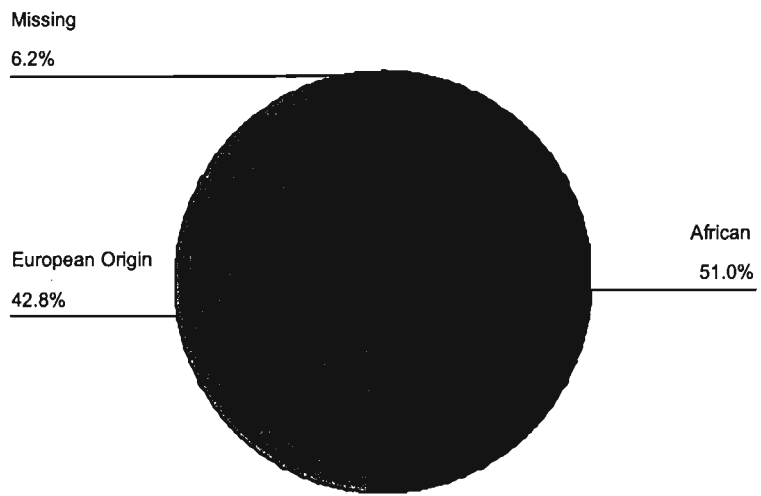
Grade



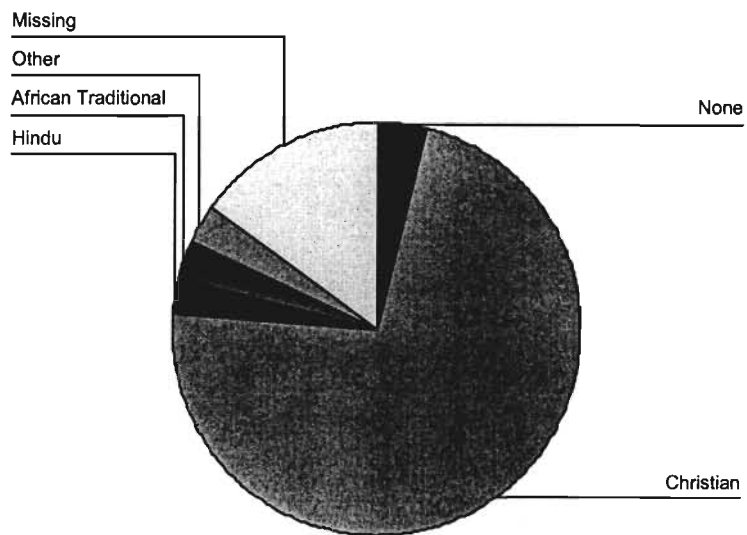
Sex



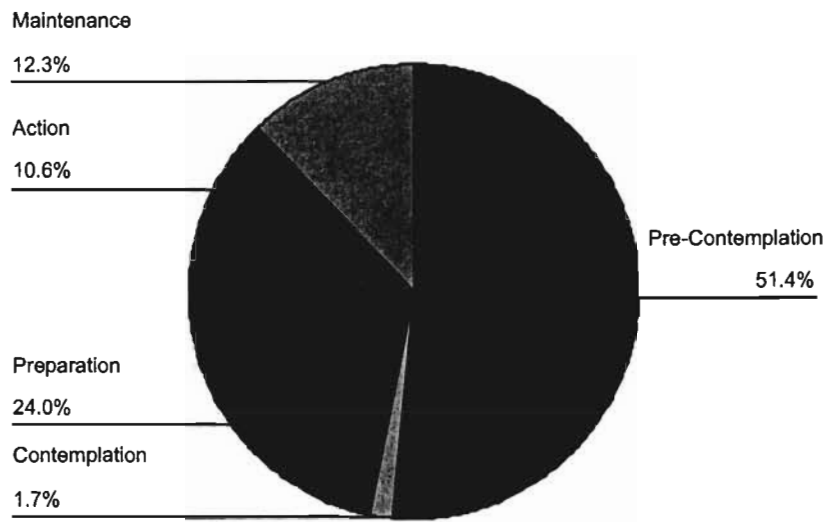
Home Language



Religion



STAGE



Appendix B – TTM questionnaires for Decisional Balance and Temptation

Available February 2004:

<http://www.uri.edu/research/cprc/measures/Smoking Self Efficacy - Temptation.htm>

Cancer Prevention Research Center

Measures

Smoking: Self-Efficacy / Temptation (Long Form)

Listed below are situations that lead some people to smoke. We would like to know HOW TEMPTED you may be to smoke in each situation. Please answer the following questions using the following five point scale.

- 1 = Not at all tempted**
- 2 = Not very tempted**
- 3 = Moderately tempted**
- 4 = Very tempted**
- 5 = Extremely tempted**

1. At a bar or cocktail lounge having a drink.
2. When I am desiring a cigarette.
3. When things are not going the way I want and I am frustrated.
4. With my spouse or close friend who is smoking.
5. When there are arguments and conflicts with my family.
6. When I am happy and celebrating.
7. When I am very angry about something or someone.
8. When I would experience an emotional crisis, such as an accident or death in the family.
9. When I see someone smoking and enjoying it.
10. Over coffee while talking and relaxing.
11. When I realize that quitting smoking is an extremely difficult task for me.
12. When I am craving a cigarette.
13. When I first get up in the morning.
14. When I feel I need a lift.

15. When I begin to let down on my concern about my health and am less physically active.
16. With friends at a party.
17. When I wake up in the morning and face a tough day.
18. When I am extremely depressed.
19. When I am extremely anxious and stressed.
20. When I realize I haven't smoked for a while.

Scoring

Positive Affect / Social Situations	1, 4, 6, 9, 10, 16
Negative Affect Situations	3, 5, 7, 8, 18, 19
Habitual / Craving Situations	11, 13, 14, 15, 20

References

Velicer, W.F., DiClemente, C.C., Rossi, J.S., & Prochaska, J.O. (1990). Relapse situations and self-efficacy: An integrative model. *Addictive Behaviors*, 15, 271-283.

Available February 2004:

[http://www.uri.edu/research/cprc/measures/Smoking Decisional Balance.htm](http://www.uri.edu/research/cprc/measures/Smoking%20Decisional%20Balance.htm)

Cancer Prevention Research Center
Measures

Smoking: Decisional Balance
(Long Form)

The following statements represent different opinions about smoking. Please rate HOW IMPORTANT each statement is to your decision to smoke according to the following five point scale:

- 1 = Not important**
- 2 = Slightly important**
- 3 = Moderately important**
- 4 = Very important**
- 5 = Extremely important**

1. Smoking cigarettes is pleasurable.
2. My smoking affects the health of others.
3. I like the image of a cigarette smoker.
4. Others close to me would suffer if I became ill from smoking.
5. I am relaxed and therefore more pleasant when smoking.
6. Because I continue to smoke, some people I know think I lack the character to quit.
7. If I try to stop smoking I'll be irritable and a pain to be around.
8. Smoking cigarettes is hazardous to my health.
9. My family and friends like me better when I am happily smoking than when I am miserably trying to quit.
10. I'm embarrassed to have to smoke.
11. I like myself better when I smoke.
12. My cigarette smoking bothers other people.
13. Smoking helps me concentrate and do better work.
14. People think I'm foolish for ignoring the warnings about cigarette smoking.
15. Smoking cigarettes relieves tension.
16. People close to me disapprove of my smoking.

17. By continuing to smoke I feel I am making my own decisions.
18. I'm foolish to ignore the warnings about cigarettes.
19. After not smoking for a while a cigarette makes me feel great.
20. I would be more energetic right now if I didn't smoke.

Scoring

PROS	1,3,5,7,9,11,13,15,17,19 (odd numbers)
CONS	2,4,6,8,10,12,14,16,18,20 (even numbers)

References

Velicer, W.F., Diclemente C. C., Prochaska J. O., & Brandenburg N. (1985). Decisional Balance measure for assessing and predicting smoking status. Journal of Personality and Social Psychology, 48, 1279-1289.

Appendix C – Pilot Questionnaire

**** PLEASE READ THE FOLLOWING CAREFULLY ** :**

This questionnaire measures people’s attitudes towards cigarette smoking. Thank you for taking the time to consider completing it. Please note that you do not have to fill it in if you do not want to. However, I would be grateful if you could as it would help me in my research about cigarette smoking.

Any answers you give will remain confidential. This means that nobody (including your teachers or principal) will see what answers you give, and nobody will know which questionnaire belongs to you. Please do not write your name anywhere on the questionnaire. Please answer as truthfully and accurately as you can. There are no right or wrong answers; I am simply interested in what you think.

If you decide to fill in this questionnaire, please answer *all* of the questions. Some of the questions you may think do not apply to you. Please try to answer these questions anyway by giving the answer that is *closest* to what you think.

Some of the questions are very similar to other questions. This is not a trick or mistake. Please just answer these questions normally.

Please note: “Smoking” refers to cigarette tobacco smoking. It does not include smoking marijuana, “dagga” or any other substance.

Name of School: _____ Grade: _____
 Age: _____(yrs) _____(months) Sex: (M/F) _____
 Home language: (please choose one) _____ Religion: _____
 On a scale of 1-5 (1 being the least, 5 the most), how religious are you? _____
 Does your mother smoke? (Y/N) _____ Does your father smoke? (Y/N) _____

1. Are you interested in smoking cigarettes now? (Y/N) _____ 1
2. Are you interested in smoking cigarettes in the future? (Y/N) _____ 2
3. Are you planning to smoke in the next 30 days? (Y/N) _____ 3
4. Have you smoked in the past 30 days? (Y/N) _____ 4
5. Have you smoked on at least 15 days out of the past 30? (Y/N) _____ 5
6. If you smoke, would you like to give up smoking? (Y/N) _____ 6
7. About how many cigarettes have you smoked in the past year? _____ 7

These sentences below describe how some people might feel about smoking. Please read each of them and write down the number of the answer that best describes how you feel about each sentence:

- 1 = "I **disagree strongly** with this sentence"
 2 = "I **disagree** with this sentence"
 3 = "I do not **agree** or **disagree** with this sentence"
 4 = "I **agree** with this sentence"
 5 = "I **strongly agree** with this sentence"

e.g. Eating ice-cream is nice *You think it is quite nice, but not VERY nice, so you say:* 4
 OR, I like the taste of cabbage *You really hate cabbage, so you say:* 1

8. I like the image of a cigarette smoker _____ 8
9. I like myself better when I'm smoking _____ 9
10. If you smoke, it shows that you can make your own decisions _____ 10
11. I look older and more mature if I smoke _____ 11
12. Smoking makes me feel like I fit in more _____ 12
13. Smoking cigarettes is pleasurable _____ 13
14. Smoking makes you feel more relaxed _____ 14

15. Smoking helps you concentrate and do better work	___ 15
16. Smoking cigarettes relieves tension	___ 16
17. After not smoking for a while, smoking makes you feel great	___ 17
18. Others would suffer if I became ill from smoking	___ 18
19. People who smoke have weak character	___ 19
20. Smoking is an embarrassing habit	___ 20
21. Smoking bothers other people	___ 21
22. My parents would disapprove of me smoking	___ 22
23. I am worried that my parents will find out if I smoke	___ 23
24. People think it's stupid to ignore health warnings on cigarettes	___ 24
25. Smoking affects the health of others	___ 25
26. Smoking is bad for me	___ 26
27. It is foolish to ignore the health warnings on cigarettes	___ 27
28. Smoking drains your energy	___ 28
29. Smoking makes you worse at sport	___ 29
30. If I smoke I will become addicted	___ 30

These statements are about smoking in everyday life. Please answer by writing the number of the answer that best describes how you feel:

- 1 = "I disagree strongly with this sentence"
 2 = "I disagree with this sentence"
 3 = "I do not agree or disagree with this sentence"
 4 = "I agree with this sentence"
 5 = "I strongly agree with this sentence"

31. There is often someone smoking in my home	___ 31
32. Smoking is a normal part of adult life	___ 32
33. Smoking should not be allowed in public places such as shopping centres	___ 33
34. I find smoking in restaurants unpleasant	___ 34
35. People who smoke around non-smokers have no respect for others	___ 35
36. If they want to, people should have the right to smoke	___ 36
37. There is nothing wrong with an adult smoking in a bar or pub	___ 37
38. Smokers should have areas available where they can smoke in public	___ 38

- | | |
|---|--------|
| 39. Smoking is something cool people do | ___ 39 |
| 40. Smoking cigarettes is a sign of maturity | ___ 40 |
| 41. People who smoke live their lives as they want to | ___ 41 |
| 42. Smokers have more exciting lives | ___ 42 |
| 43. People who smoke are foolish | ___ 43 |
| 44. Smokers are more often in trouble | ___ 44 |

Please answer these questions about smoking in everyday life:

- | | |
|---|--------|
| 45. Out of every 10 adults, how many do you think smoke? (0 – 10) | ___ 45 |
| 46. Out of every 10 people your age, how many smoke? (0 – 10) | ___ 46 |

In these sentences, people are describing situations where they feel tempted to smoke. Please say how tempted you would be to smoke in these situations. Write the number of the answer that best describes how you feel:

- 1 = “I would be **not at all** tempted to smoke in this situation”
 2 = “I would be **a little bit** tempted to smoke in this situation”
 3 = “I would be **fairly** tempted to smoke in this situation”
 4 = “I would be **very** tempted to smoke in this situation”
 5 = “I would be **extremely** tempted to smoke in this situation”

- | | |
|---|--------|
| 47. With my boyfriend/girlfriend or close friend who is smoking | ___ 47 |
| 48. When I am happy or celebrating | ___ 48 |
| 49. When I see someone else smoking and enjoying it | ___ 49 |
| 50. While talking and relaxing with friends | ___ 50 |
| 51. At a party with friends | ___ 51 |
| 52. When I am at a friends house | ___ 52 |
| 53. When a friend offers me a cigarette | ___ 53 |
| 54. When I am somewhere where everyone else is smoking | ___ 54 |
| 55. When I feel like I am being forced to smoke by my friends | ___ 55 |
| 56. When things don't go the way I want and I am frustrated | ___ 56 |
| 57. When there are arguments or conflicts with my family | ___ 57 |
| 58. When I am angry about something or someone | ___ 58 |

59. When I am experiencing an emotional crisis, such as a death in the family	___ 59
60. When I am extremely depressed	___ 60
61. When I am extremely anxious or stressed	___ 61
62. When I realize it would be hard for me not to have a cigarette	___ 62
63. Before school almost every day	___ 63
64. When I feel I need a lift	___ 64
65. When I realize I haven't smoked for a while	___ 65
66. When I am curious to see what smoking is like	___ 66
67. When I see other people smoking and I wonder what its like	___ 67
68. When I have nothing to do	___ 68
69. When I am bored	___ 69
70. If I am worried that I am eating too much and look fat	___ 70

Appendix D – The Final Version of the Questionnaire

**** PLEASE READ THE FOLLOWING CAREFULLY ** :**

This questionnaire measures people’s attitudes towards cigarette smoking. Thank you for taking the time to Consider completing it. Please note that you do not have to fill it in if you do not want to. However, I would be grateful if you could as it would help me in my research about cigarette smoking.

Any answers you give will remain confidential. This means that nobody (including your teachers or principal) will see what answers you give, and nobody will know which questionnaire belongs to you. Please do not write your name anywhere on the questionnaire. Please answer as truthfully and accurately as you can. There are no right or wrong answers; I am simply interested in what you think.

If you decide to fill in this questionnaire, please answer *all* of the questions. Some of the questions you may think do not apply to you. Please try to answer these questions anyway by giving the answer that is *closest* to what you think.

Please note: “Smoking” refers to cigarette tobacco smoking. It does not include smoking marijuana, “dagga” or any other substance.

Name of School: _____ Grade: _____

Age: _____(yrs) _____(months) Sex: (M/F)_____

Home language: (please choose one)_____ Religion: _____

On a scale of 1-5 (1 being the least, 5 the most), how religious are you? _____

Does your mother smoke? (Y/N) _____ Does your father smoke? (Y/N) _____

How many adults (out of every 10) do you think smoke? (0-10) _____

1. Are you interested in smoking cigarettes now? (Y/N) _____1
2. Are you interested in smoking cigarettes in the future? (Y/N) _____2
3. Have you smoked at all in the past year? (Y/N) _____3
4. Have you smoked in the past 30 days? (Y/N) _____4
5. Have you smoked on *more than* 15 days out of the past 30? (Y/N) _____5
6. How many units of *alcohol* do you drink per week (one shot or one beer = 1 unit) _____6
7. About how many cigarettes have you smoked in the past year? _____7

These sentences below describe how some people might feel about smoking. Please read each of them and write down the number of the answer that best describes how you feel about each sentence:

1 = "I disagree strongly with this sentence"

2 = "I disagree with this sentence"

3 = "I do not agree or disagree with this sentence"

4 = "I agree with this sentence"

5 = "I strongly agree with this sentence"

e.g. Eating ice-cream is nice *You think it is quite nice, but not VERY nice, so you say:* 4

OR, I like the taste of cabbage *You really hate cabbage, so you say:* 1

8. I like the image of a cigarette smoker _____8
9. I look older if I smoke _____9
10. Smoking makes me feel like I fit in more _____10
11. Smoking cigarettes is pleasurable _____11
12. I feel more relaxed when smoking _____12
13. Smoking helps you concentrate and do better work _____13
14. Smoking cigarettes relieves tension _____14
15. People who smoke have weak character _____15
16. Smoking is an embarrassing habit _____16

- | | |
|--|-------|
| 17. Smoking bothers other people | ___17 |
| 18. Smoking affects the health of others | ___18 |
| 19. Smoking is bad for me | ___19 |
| 20. Smoking drains your energy | ___20 |
| 21. Smoking makes you worse at sport | ___21 |
| 22. If I smoke I will become addicted | ___22 |

These statements are about smoking in everyday life. Please answer by writing the number of the answer that best describes how you feel:

- 1 = "I disagree strongly with this sentence"**
2 = "I disagree with this sentence"
3 = "I do not agree or disagree with this sentence"
4 = "I agree with this sentence"
5 = "I strongly agree with this sentence"

- | | |
|---|-------|
| 23. I have noticed many of my favourite movie stars or actors smoking | ___23 |
| 24. Most people my age smoke | ___24 |
| 25. Many of the people I admire at school are smokers | ___25 |
| 26. People who smoke are the most popular people at school | ___26 |
| 27. I feel pressured to smoke by my friends | ___27 |
| 28. I will probably smoke in the future because one or both of my parents smoke | ___28 |
| 29. My friends don't think smoking is bad | ___29 |

In these sentences, people are describing situations where they feel tempted to smoke. Please say how tempted you would be to smoke in these situations. Write the number of the answer that best describes how you feel:

1 = "I would be **not at all** tempted to smoke in this situation"

2 = "I would be a **little bit** tempted to smoke in this situation"

3 = "I would be **fairly** tempted to smoke in this situation"

4 = "I would be **very** tempted to smoke in this situation"

5 = "I would be **extremely** tempted to smoke in this situation"

- | | |
|--|--------|
| 30. When I am happy or celebrating | ___ 30 |
| 31. At a party with friends | ___ 31 |
| 32. When things don't go the way I want and I am frustrated | ___ 32 |
| 33. When there are arguments or conflicts with my family | ___ 33 |
| 34. When I am angry about something or someone | ___ 34 |
| 35. When I am extremely depressed | ___ 35 |
| 36. When I am extremely anxious or stressed | ___ 36 |
| 37. When I see someone else smoking and enjoying it | ___ 37 |
| 38. When I am at a friends house | ___ 38 |
| 39. When I have nothing to do | ___ 39 |
| 40. When I am bored | ___ 40 |
| 41. When I am curious to see what smoking is like | ___ 41 |
| 42. When I see other people smoking and I wonder what its like | ___ 42 |

Please check to see if you have answered all the questions and make sure that you have not written your name anywhere. Thank you for taking the time to complete this questionnaire. It is greatly appreciated.

Appendix E – Instructions to Facilitators Implementing Questionnaire

Andrew Burnard
University of KwaZulu-Natal
Pietermaritzburg
School of Psychology
20 April 2004

Dear ,

Thank you for participating in my research project. Here are the questionnaires. Please could you give them to one grade 9 and one grade 12 class as we discussed.

When you give the learners the questionnaire, please could you tell them that it is investigating attitudes to smoking in teenagers, but tell them no more than that. Also, could you kindly direct their attention to the covering page of the questionnaire, asking them to read it carefully, as it contains instructions for completing the questionnaire and details their rights as participants. Please stress that their answers will be kept completely confidential. With regards to confidentiality, please let me reiterate that the name or distinguishing features of your school will not be mentioned anywhere in the report.

Please contact me if you have any queries and to let me know when the questionnaires have been completed.

Yours faithfully

Andrew Burnard

Appendix F – Exploratory Data Analysis

Parametric Assumption Testing

Descriptive Statistics							
	N	Minimum	Maximum	Mean	Std.	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Social Pros	287	.20	1.00	.3707	.16931	.880	.144
Coping Pros	285	.20	1.00	.4121	.21235	.738	.144
Pros	285	.20	.89	.3945	.17436	.717	.144
Social Cons	285	.20	1.00	.6482	.19926	-.130	.144
Health Cons	282	.20	1.00	.7799	.20450	-1.265	.145
Cons	281	.20	1.00	.7322	.18576	-1.011	.145
Perceived Social Norms	283	.20	.89	.5127	.13121	.253	.145
Temptation	273	.20	.97	.3610	.18923	1.228	.147
Social Situations	286	.20	1.00	.3601	.20648	1.271	.144
Affect Regulation	286	.20	1.00	.3690	.23620	1.267	.144
Boredom	287	.20	1.00	.3188	.22108	1.881	.144
Curiosity	274	.20	1.00	.3934	.24200	1.190	.147
Valid N (listwise)	263						

Table F1 : Descriptive statistics for Decisional Balance, Temptation and Perceived Social Norms and their sub-scales. The standardised nature of the scores refers to the scores given as a proportion of the total possible score for that variable.

Tests of Normality

	Stage of Acquisition	Shapiro-Wilk		
		Statistic	df	Sig.
Social Pros	Pre-Contemplation	.787	140	.000
	Preparation	.895	61	.000
	Action	.961	30	.322
	Maintenance	.949	32	.132
Coping Pros	Pre-Contemplation	.774	140	.000
	Preparation	.926	61	.001
	Action	.963	30	.373
	Maintenance	.946	32	.114
Pros	Pre-Contemplation	.843	140	.000
	Preparation	.940	61	.005
	Action	.964	30	.400
	Maintenance	.979	32	.762
Social Cons	Pre-Contemplation	.956	140	.000
	Preparation	.973	61	.192
	Action	.951	30	.175
	Maintenance	.965	32	.384
Health Cons	Pre-Contemplation	.805	140	.000
	Preparation	.830	61	.000
	Action	.976	30	.712
	Maintenance	.969	32	.486
Cons	Pre-Contemplation	.868	140	.000
	Preparation	.891	61	.000
	Action	.978	30	.763
	Maintenance	.982	32	.849
Perceived Social Norms	Pre-Contemplation	.983	140	.086
	Preparation	.979	61	.387
	Action	.925	30	.036
	Maintenance	.969	32	.476
Temptation	Pre-Contemplation	.657	140	.000
	Preparation	.924	61	.001
	Action	.965	30	.420
	Maintenance	.952	32	.163
Social Situations	Pre-Contemplation	.534	140	.000
	Preparation	.873	61	.000
	Action	.959	30	.297
	Maintenance	.920	32	.021
Affect Regulation	Pre-Contemplation	.528	140	.000
	Preparation	.801	61	.000
	Action	.915	30	.020
	Maintenance	.947	32	.115
Boredom	Pre-Contemplation	.322	140	.000
	Preparation	.702	61	.000
	Action	.726	30	.000
	Maintenance	.867	32	.001
Curiosity	Pre-Contemplation	.711	140	.000
	Preparation	.874	61	.000
	Action	.879	30	.003
	Maintenance	.789	32	.000

Table F2: Testing the Assumption of Normality for a number of test variables. A significant value indicates a departure from normality.

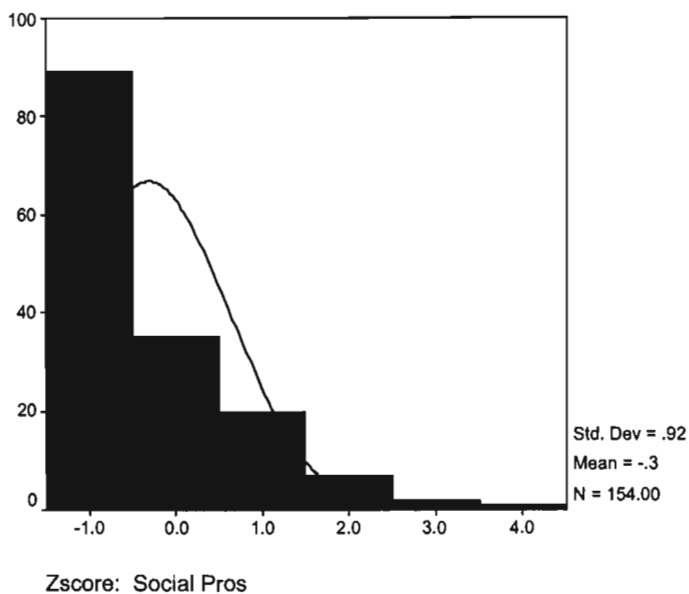


Figure F1: Histogram showing the frequency of individual social Pros scores for Pre-contemplation. A departure from normality can be seen.

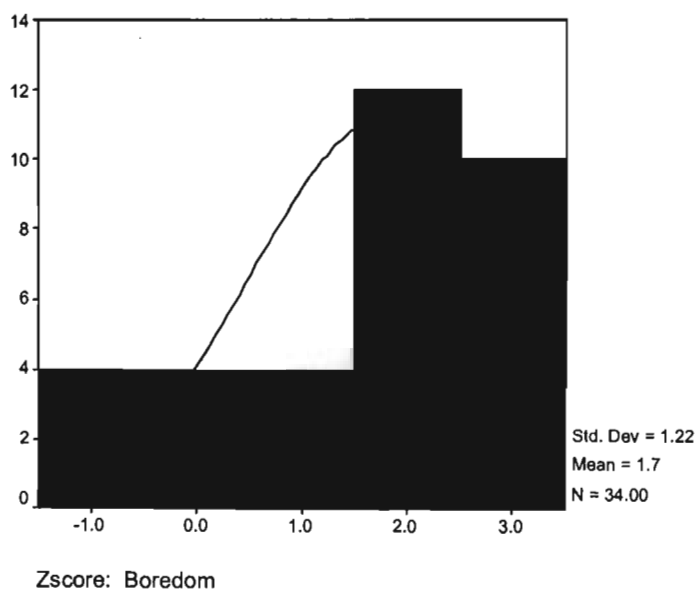


Figure F2: Histogram showing the frequency of individual boredom situations scores for Maintenance. A departure from normality can be seen.

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Zscore: Social Pros	.944	3	283	.420
Zscore: Coping Pros	3.443	3	281	.017
Zscore: Pros Combined	1.222	3	281	.302
Zscore: Social Cons	1.373	3	281	.251
Zscore: Health Cons	3.719	3	278	.012
Zscore: Cons Combined	3.393	3	277	.018
Zscore: Perceived Social Norms	1.289	3	279	.278
Zscore: Temptation Overall	11.440	3	269	.000
Zscore: Social Situations	20.526	3	282	.000
Zscore: Affect Regulation	9.108	3	282	.000
Zscore: Boredom	39.208	3	283	.000
Zscore: Curiosity	14.490	3	270	.000
Alcohol per week	14.483	3	272	.000
Perceived adult smokers /10	1.379	3	272	.250

Table F3: Results of Levene's test for Homogeneity of Variances for ANOVA.

A significant result indicates heterogeneous variances; and this occurred in a number of cases. For this reason the Welch procedure was used to compare group means rather than relying on a possibly unreliable analysis of variance.

			Stage of Change											
			Pre-Contemplation			Preparation			Action			Maintenance		
			Count	% in Stage	Column %	Count	% in Stage	Column %	Count	% in Stage	Column %	Count	% in Stage	Column %
Home Language	African	Male	32	48,5%	36,8%	17	25,8%	45,9%	8	12,1%	61,5%	9 ^b	13,6%	90,0%
		Female	55 ^c	67,9%	63,2%	20	24,7%	54,1%	5	6,2%	38,5%	1	1,2%	10,0%
	European Origin	Male	28	48,3%	47,5%	11	19,0%	39,3%	7	12,1%	50,0%	12	20,7%	52,2%
		Female	31	47,0%	52,5%	17	25,8%	60,7%	7	10,6%	50,0%	11	16,7%	47,8%
Grade	Grade 9		81	53,3%	52,3%	41	27,0%	58,6%	15	9,9%	48,4%	15	9,9%	41,7%
	Grade 12		74	52,9%	47,7%	29	20,7%	41,4%	16	11,4%	51,6%	21	15,0%	58,3%
Mother Smoke	No	Male	56	50,0%	39,7%	26	23,2%	48,1%	12	10,7%	50,0%	18	16,1%	78,3%
		Female	85	65,4%	60,3%	28	21,5%	51,9%	12	9,2%	50,0%	5	3,8%	21,7%
	Yes	Male	5	31,3%	45,5%	3	18,8%	25,0%	3	18,8%	75,0%	5	31,3%	41,7%
		Female	6 ^d	26,1%	54,5%	9	39,1%	75,0%	1	4,3%	25,0%	7 ^e	30,4%	58,3%
Father Smoke	No	Male	47	50,5%	41,6%	21	22,6%	47,7%	9	9,7%	50,0%	16	17,2%	66,7%
		Female	66	62,3%	58,4%	23	21,7%	52,3%	9	8,5%	50,0%	8	7,5%	33,3%
	Yes	Male	14	46,7%	41,2%	5	16,7%	26,3%	5	16,7%	55,6%	6	20,0%	60,0%
		Female	20	47,6%	58,8%	14	33,3%	73,7%	4	9,5%	44,4%	4	9,5%	40,0%
Religion	None		2	18,2%	1,5%	2	18,2%	3,6%	2	18,2%	7,4%	5	45,5%	16,7%
	Christian		122	57,8%	89,7%	47	22,3%	85,5%	23	10,9%	85,2%	19	9,0%	63,3%
	Hindu		5	62,5%	3,7%	2	25,0%	3,6%	0	,0%	,0%	1	12,5%	3,3%
	African Traditional		5	55,6%	3,7%	3	33,3%	5,5%	0	,0%	,0%	1	11,1%	3,3%
	Other		2	22,2%	1,5%	1	11,1%	1,8%	2	22,2%	7,4%	4	44,4%	13,3%

- a. Violation of assumption of normality due to small cell sizes results in difficulty drawing conclusions.
- b. Significantly higher occurrence of males than expected, $p < 0.05$.
- c. Significantly higher occurrence of females than expected, $p < 0.05$.
- d. Significantly fewer females in pre-contemplation when mother smokes than when she does not, $p < 0.01$.
- e. Significantly more females in maintenance when mother smokes than when she does not, $p < 0.01$.

Table F4: Demographic Frequencies of Stages showing Statistically Significant Differences.

Table F5: Variable Scores by Sex, Grade, Language and Stages.

	Sex		Grade		Home Language		Stage of Change			
	Male	Female	Grade 9	Grade 12	African	European	Pre-Cont.	Preparation	Action	Maintenance
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Social Pros	,38	,36	,37	,37	,36	,38	,32	,38	,45	,51
Coping Pros	,43	,40	,42	,40	,37	,45	,31	,43	,54	,74
Pros	,41	,38	,40	,39	,37	,42	,31	,41	,50	,64
Social Cons	,65	,65	,68	,62	,66	,63	,67	,67	,61	,53
Health Cons	,77	,78	,79	,77	,78	,78	,78	,79	,76	,75
Cons	,73	,74	,75	,72	,74	,73	,75	,75	,71	,67
Perceived Social Norm:	,52	,50	,53	,49	,51	,51	,49	,54	,53	,56
Temptation	,37	,35	,38	,34	,32	,41	,26	,37	,44	,71
Social Situations	,37	,35	,37	,35	,33	,41	,25	,38	,50	,70
Affect Regulation	,39	,36	,38	,36	,32	,44	,26	,36	,43	,82
Boredom	,33	,31	,34	,30	,29	,36	,23	,32	,36	,70
Curiosity	,38	,40	,44	,35	,38	,42	,32	,48	,44	,49
How Religious	3,03	3,14	3,14	3,05	3,27	2,88	3,24	3,27	2,85	2,33
# Cigarettes past year	991	133	820	147	773	239	0	21	30	4748

Table F6: Statistically Significant Differences of Variables across Sex, Grade, Language and Stage.

Comparisons of Column Means										
	Sex		Grade		Home Language			Stage of Change		
	Male	Female	Grade 9	Grade 12	African	European Origin	Pre-Conte mplantation	Preparation	Action	Maintenance
	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(C)	(D)
Social Pros								A	A	A B
Coping Pros						A		A	A B	A B C
Pros						A		A	A B	A B C
Social Cons			B				D	D		
Health Cons										
Cons										
Perceived Social Norms			B					A		A
Temptation						A		A	A	A B C
Social Situations						A		A	A B	A B C
Affect Regulation						A		A	A	A B C
Boredom						A		A	A	A B C
Curiosity			B					A		A
How Religious					B		D	D		
# cigarettes past year										A B C

Results are based on two-sided tests assuming equal variances with significance level 0.05. For each significant pair, the key of the smaller category is larger mean.

a. Tests are adjusted for all pairwise comparisons within each innermost subtable using the Bonferroni correction.

Statistics

		School	Grade	Sex	Home Language	Religion	Stage of Acquisition
N	Valid	292	292	284	274	248	292
	Missing	0	0	8	18	44	0
Mode		4	9	1	1	1	0

Table F7: Frequency statistics for categorical variables

School

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	A	72	24.7	24.7	24.7
	B	46	15.8	15.8	40.4
	C	64	21.9	21.9	62.3
	D	110	37.7	37.7	100.0
	Total	292	100.0	100.0	

Table F8: Frequency statistics for School

Grade

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Grade 9	152	52.1	52.1	52.1
	Grade 12	140	47.9	47.9	100.0
	Total	292	100.0	100.0	

Table F9: Frequency statistics for Grade

Sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	130	44.5	45.8	45.8
	Female	154	52.7	54.2	100.0
	Total	284	97.3	100.0	
Missing	System	8	2.7		
Total		292	100.0		

Table F10: Frequency statistics for Sex

Home Language

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	African	149	51.0	54.4	54.4
	European Origin	125	42.8	45.6	100.0
	Total	274	93.8	100.0	
Missing	System	18	6.2		
Total		292	100.0		

Table F11: Frequency statistics for Home Language

Religion

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	11	3.8	4.4	4.4
	Christian	211	72.3	85.1	89.5
	Hindu	8	2.7	3.2	92.7
	African Traditional	9	3.1	3.6	96.4
	Other	9	3.1	3.6	100.0
	Total	248	84.9	100.0	
Missing	System	44	15.1		
Total		292	100.0		

Table F12: Frequency statistics for Religion

Stage of Acquisition

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pre-Contemplation	155	53.1	53.1	53.1
	Preparation	70	24.0	24.0	77.1
	Action	31	10.6	10.6	87.7
	Maintenance	36	12.3	12.3	100.0
	Total	292	100.0	100.0	

Table F13: Frequency statistics for Stage of Acquisition

Missing Data Analysis

Univariate Statistics

	N	Mean	Std. Deviation	Missing	
				Count	Percent
School	292			0	.0
Grade	292			0	.0
Sex	284			8	2.7
Language background	274			18	6.2
Religion	248			44	15.1
Religious conviction	260			32	11.0
Mother Smoke?	285			7	2.4
Father smoke?	275			17	5.8
# adult smokers /10 ?	276	6.40	1.995	16	5.5
Q1 - Smoke now?	291	.20	.637	1	.3
Q2 - Future smoke?	291	.12	.330	1	.3
Q3 - Smoked past year?	292	.45	.499	0	.0
Q4 - Smoked past 30 days?	291	.23	.419	1	.3
Q5 - Smoked more than 15 days?	292	.13	.333	0	.0
Q6 - Alcohol per week?	276	2.05	5.451	16	5.5
Q7 - Cigs per year?	279	501.62	6037.854	13	4.5
Social Pros - scale total	287	5.5610	2.53967	5	1.7
Coping Pros - scale total	285	8.2421	4.24691	7	2.4
Social Cons - scale total	285	9.7228	2.98889	7	2.4
Health Cons - scale total	282	19.4965	5.11244	10	3.4
Perceived Social Norms -scale tot	283	17.94346	4.592275	9	3.1
Social Situations - scale total	286	7.2028	4.12958	6	2.1
Affect regulation - scale total	286	9.2238	5.90500	6	2.1
Boredom - scale total	287	3.1882	2.21078	5	1.7
Curiosity - scale total	274	3.9343	2.42002	18	6.2

Table F14: Showing number of missing responses by variable. Salient omissions are the failure of 15.1% of participants to declare religion and the reluctance of 6.2% to respond to the item asking for language background. Missing data from scale totals resulted from one or more items in the scale being omitted making calculating the scale total impossible. No data was missing from the school or grade variables as these were known qualities and were entered into the database even if omitted from the questionnaire.

One-way ANOVA with missing as DV and school as IV

Descriptives

Number of answers missing

School	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
A	72	3.94	9.033	1.065	1.82	6.07	0	46
B	46	1.46	.936	.138	1.18	1.73	1	6
C	64	.38	.900	.112	.15	.60	0	6
D	110	.87	2.176	.207	.46	1.28	0	20
Total	292	1.61	4.887	.286	1.05	2.18	0	46

Table F15: Average number of missing data for four schools A, B, C and D.

ANOVA

Number of answers missing

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	550.862	3	183.621	8.262	.000
Within Groups	6400.409	288	22.224		
Total	6951.271	291			

Number of answers missing

Tukey HSD^{a,b}

SCHOOL	N	Subset for alpha = .05	
		1	2
C	64	.38	
D	110	.87	
B	46	1.46	
A	72		3.94
Sig.		.550	1.000

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 66.287.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table F16: ANOVA Statistic and Tukey's HSD homogenous subsets indicating group differences. The results of the above ANOVA and the adjacent post hoc tests indicate that school A has significantly more missing data points than the three other schools.

One-way ANOVA with missing as DV and Grade as IV

Descriptives

Number of answers missing

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Grade 9	152	1.35	3.622	.294	.77	1.93	0	37
Grade 12	140	1.90	5.967	.504	.90	2.90	0	46
Total	292	1.61	4.887	.286	1.05	2.18	0	46

Table F17: Average number of missing data for grades 9 and 12.

ANOVA

Number of answers missing

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	22.151	1	22.151	.927	.336
Within Groups	6929.120	290	23.894		
Total	6951.271	291			

Table F18: ANOVA Statistic for differences between grades on missing.

One-way ANOVA with missing as DV and Gender as IV

Descriptives

Number of answers missing

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Male	130	1.47	3.656	.321	.83	2.10	0	35
Female	154	1.25	4.417	.356	.55	1.96	0	37
Total	284	1.35	4.081	.242	.88	1.83	0	37

Table F19: Average number of missing data for genders.

ANOVA

Number of answers missing

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.288	1	3.288	.197	.658
Within Groups	4709.500	282	16.700		
Total	4712.789	283			

Table F20: ANOVA Statistic for differences between genders on missing.

One-way ANOVA with missing as DV and Language as IV

Descriptives

Number of answers missing

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
African	149	1.54	4.710	.386	.77	2.30	0	37
European Origin	125	.96	3.209	.287	.39	1.53	0	35
Total	274	1.27	4.097	.248	.79	1.76	0	37

Table F21: Average number of missing data for language groups.

Robust Tests of Equality of Means

Number of answers missing

	Statistic ^a	df1	df2	Sig.
Welch	1.439	1	261.526	.231

a. Asymptotically F distributed.

Table F22: Welch Statistic for differences between languages on missing.

One-way ANOVA with missing as DV and Religion as IV

Descriptives

Number of answers missing

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
None	11	.82	1.079	.325	.09	1.54	0	3
Christian	211	1.09	3.905	.269	.56	1.62	0	36
Hindu	8	.38	.518	.183	-.06	.81	0	1
African Traditional	9	.67	1.000	.333	-.10	1.44	0	3
Other	9	.67	.707	.236	.12	1.21	0	2
Total	248	1.02	3.619	.230	.57	1.47	0	36

Table F23: Average number of missing data for religious groups.

ANOVA

Number of answers missing

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.923	4	1.731	.130	.971
Within Groups	3227.976	243	13.284		
Total	3234.899	247			

Table F24: ANOVA Statistic for differences between religions on missing.

One-way ANOVA with missing as DV and Stage as IV

Descriptives

Number of answers missing

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Pre-Contemplation	155	1.23	3.662	.294	.65	1.81	0	36
Preparation	70	1.97	4.809	.575	.82	3.12	0	37
Action	31	1.06	1.843	.331	.39	1.74	0	10
Maintenance	36	3.03	9.373	1.562	-.14	6.20	0	46
Total	292	1.61	4.887	.286	1.05	2.18	0	46

Table F25: Average number of missing data for stages.

Robust Tests of Equality of Means

Number of answers missing

	Statistic ^a	df1	df2	Sig.
Welch	1.034	3	93.753	.381

a. Asymptotically F distributed.

Table F26: Welch Statistic for differences between religions on missing.

Reliability Analysis

Rotated Component Matrix^a

	Component		
	1	2	3
Q8 - Social Pros	-.076	.703	.069
Q9 - Social Pros	.002	.208	.763
Q10 - Social Pros	.014	.385	.703
Q11 - Coping Pros	-.021	.840	.016
Q12 - Coping Pros	-.013	.843	.148
Q13 - Coping Pros	-.034	.675	.160
Q14 - Coping Pros	.085	.783	.258
Q15 - Social Cons	.475	-.386	.380
Q16 - Social Cons	.554	-.312	.042
Q17 - Social Cons	.806	.049	-.090
Q18 - Health Cons	.834	.114	-.086
Q19 - Health Cons	.791	.099	-.044
Q20 - Health Cons	.745	-.185	.135
Q21 - Health Cons	.750	-.109	.136
Q22 - Health Cons	.657	.087	.029

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Table F27: Principle components of Decisional Balance scale.

The structure present in the above data largely conforms to the Decisional Balance structure suggested by Pallonen et al. (1998) of social Pros, coping Pros, and Cons.

Rotated Component Matrix ^a

	Component			
	1	2	3	4
Q30 - Social Situations	.402	.786	.095	.193
Q31 - Social Situations	.483	.717	.221	.162
Q32 - Affect Regulation	.782	.366	.117	.232
Q33 - Affect Regulation	.825	.237	.015	.221
Q34 - Affect Regulation	.806	.250	.084	.304
Q35 - Affect Regulation	.786	.250	.283	.158
Q36 - Affect Regulation	.821	.245	.226	.242
Q37 - Social Situations	.211	.584	.331	.379
Q38 - Social Situations	.222	.785	.179	.285
Q39 - Boredom	.379	.356	.106	.808
Q40 - Boredom	.387	.293	.131	.814
Q41 - Curiosity	.173	.132	.903	.082
Q42 - Curiosity	.112	.208	.884	.099

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
^a. Rotation converged in 5 iterations.

Table F28: Components of Temptation scale after factor analysis.

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Eigenvalue	Variance Explained	Cumulative Variance Explained	Eigenvalue	Variance Explained	Cumulative Variance Explained
1	7.579	58.302	58.302	4.059	31.225	31.225
2	1.464	11.260	69.562	2.740	21.079	52.304
3	.972	7.474	77.036	1.977	15.209	67.513
4	.662	5.089	82.125	1.900	14.612	82.125
5	.520	3.998	86.123			
6	.395	3.038	89.161			
7	.301	2.319	91.480			
8	.267	2.055	93.535			
9	.235	1.807	95.342			
10	.193	1.486	96.828			
11	.178	1.367	98.195			
12	.138	1.064	99.259			
13	.096	.741	100.000			

Extraction Method: Principal Component Analysis.

Table F29: Eigenvalues and Explained Variance for Temptation principle components analysis.

Appendix G – Application of Stage of Acquisition Construct in SA

		Statistic(a)	df1	df2	Sig.	ω^2 Effect Size
Social Pros	Welch	17.171	3	84.292	.000	0.146
Coping Pros	Welch	86.604	3	80.225	.000	0.444
Pros	Welch	68.558	3	81.930	.000	0.392
Social Cons	Welch	7.161	3	87.214	.000	0.047
Health Cons	Welch	.826	3	96.108	.483	-0.005
Cons	Welch	3.200	3	94.440	.027	0.011
Temptation	Welch	109.138	3	73.329	.000	0.571
Social Situations	Welch	84.660	3	72.162	.000	0.524
Affect Regulation	Welch	159.493	3	79.752	.000	0.544
Boredom	Welch	39.395	3	69.265	.000	0.448
Curiosity	Welch	8.892	3	74.462	.000	0.087

Table G1: Welch test for equality of means for data with heterogeneous variances for Decisional Balance and Temptation by Stage of Acquisition.

Tables G2-12: The following tables indicate statistical differences between stages.

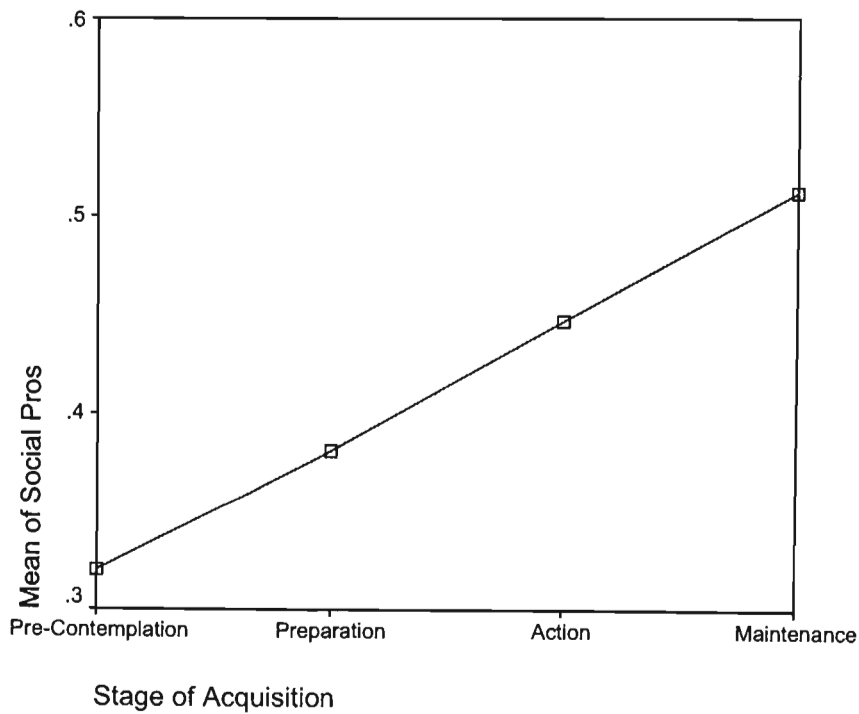
Social Pros

Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for alpha = .05		
		1	2	3
Pre-Contemplation	154	.3195		
Preparation	68	.3814	.3814	
Action	31		.4473	.4473
Maintenance	34			.5118
Sig.		.212	.165	.182

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 48.269.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Coping Pros

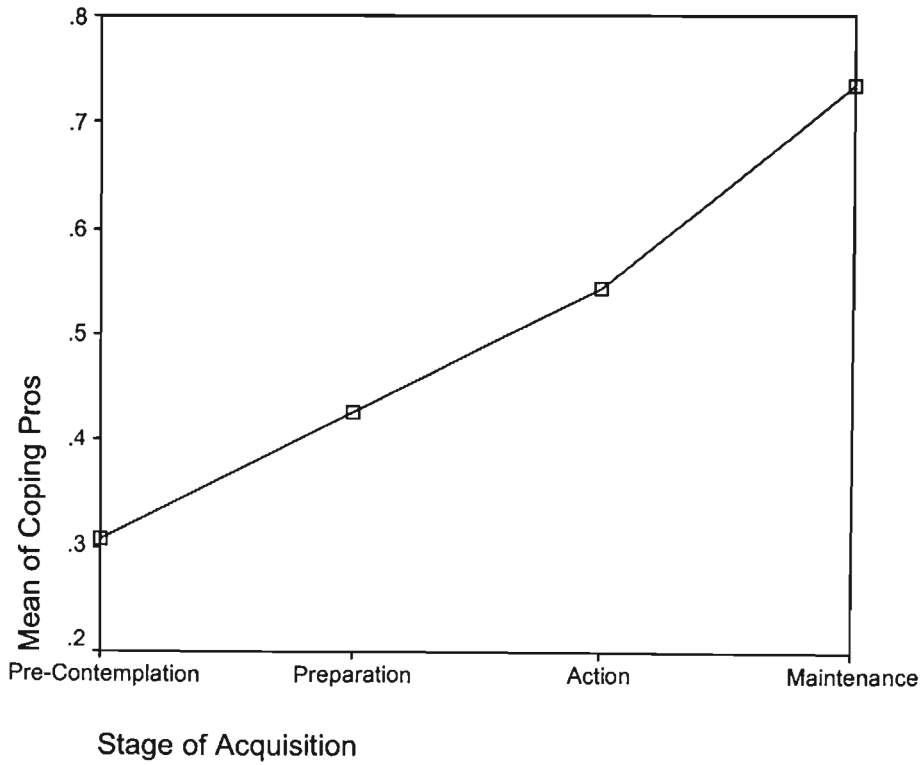
Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for alpha = .05			
		1	2	3	4
Pre-Contemplation	153	.3075			
Preparation	67		.4261		
Action	31			.5435	
Maintenance	34				.7353
Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 48.117.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Pros

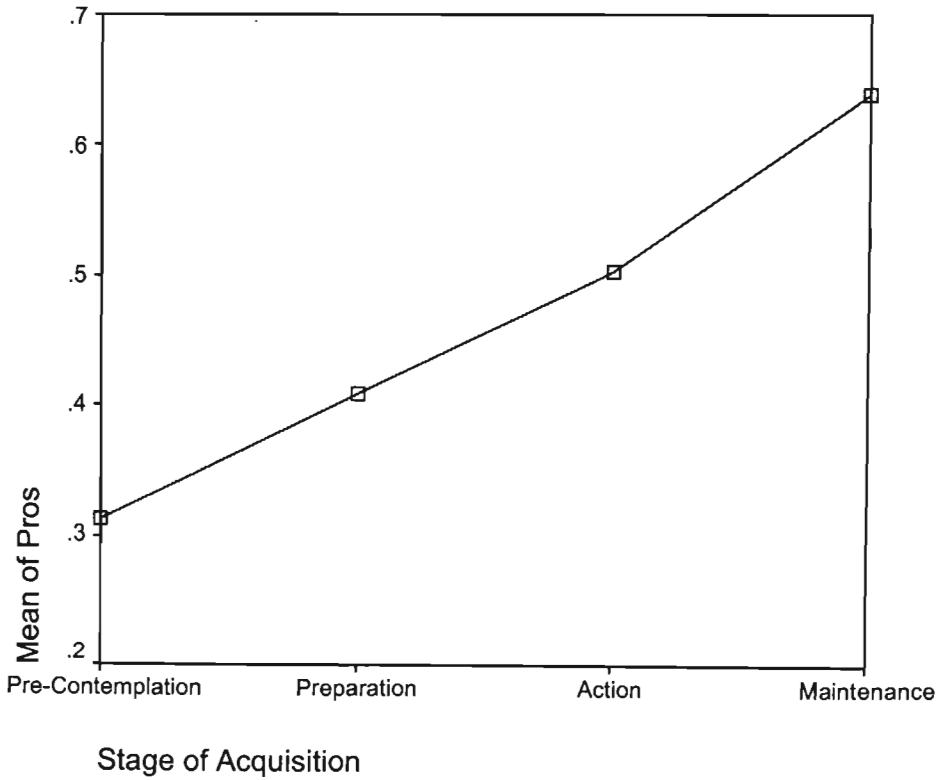
Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for alpha = .05			
		1	2	3	4
Pre-Contemplation	153	.3122			
Preparation	67		.4081		
Action	31			.5023	
Maintenance	34				.6395
Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 48.117.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Social Cons

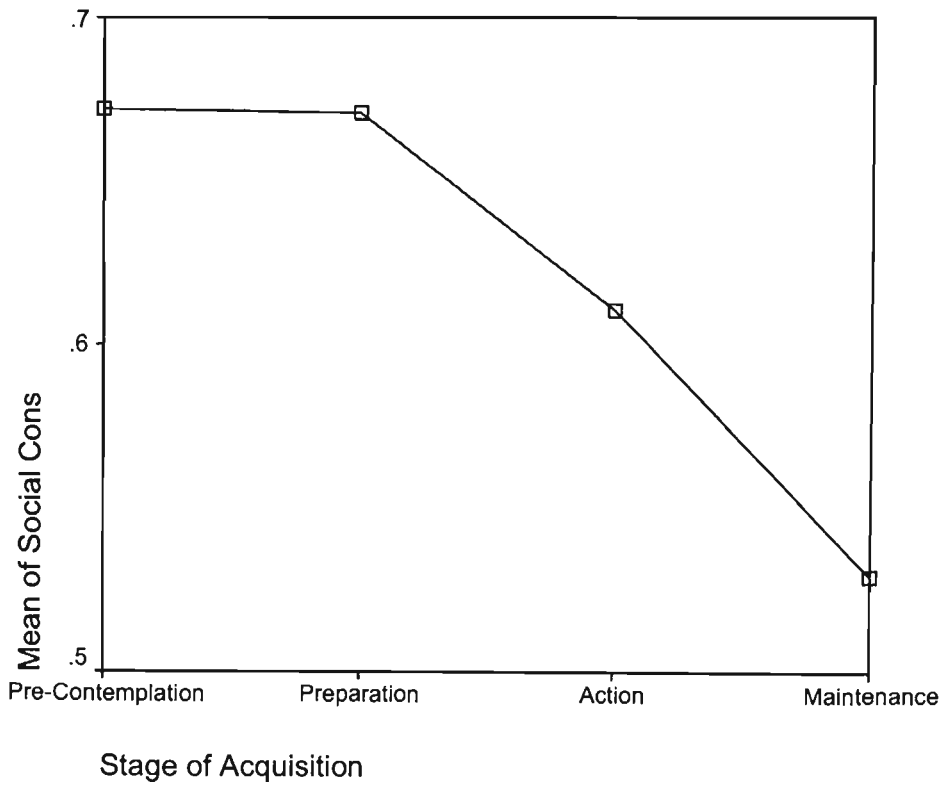
Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for alpha = .05	
		1	2
Maintenance	34	.5294	
Action	31	.6108	.6108
Preparation	68		.6706
Pre-Contemplation	152		.6724
Sig.		.171	.406

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 48.219.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



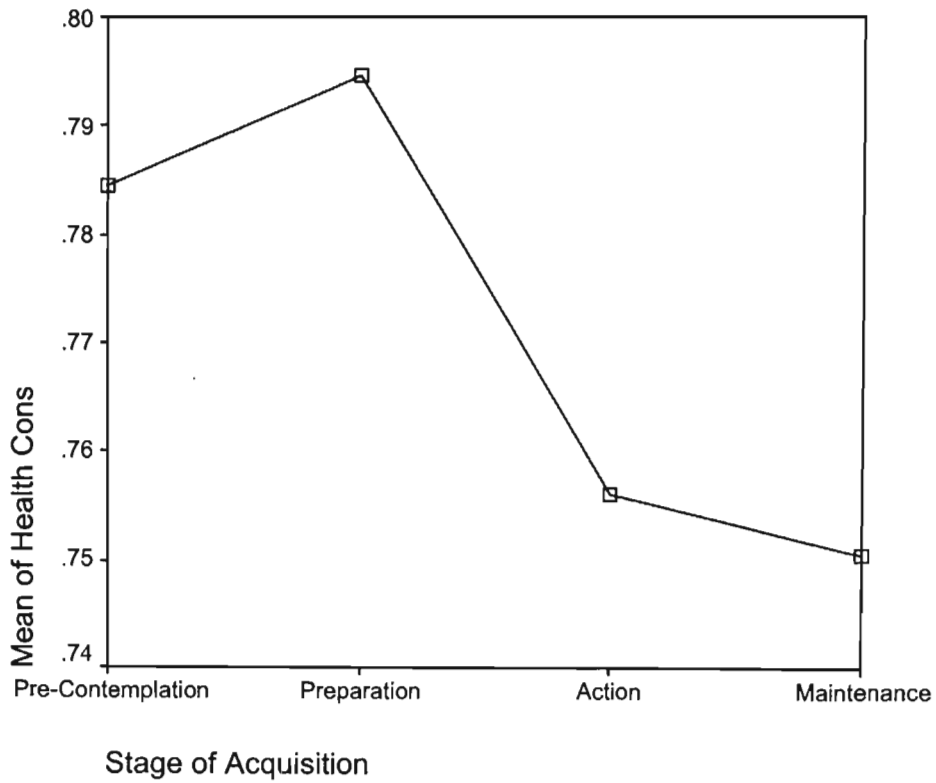
Health Cons

Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for
		alpha = .05
Maintenance	34	.7506
Action	30	.7560
Pre-Contemplation	150	.7845
Preparation	68	.7947
Sig.		.721

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 47.552.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



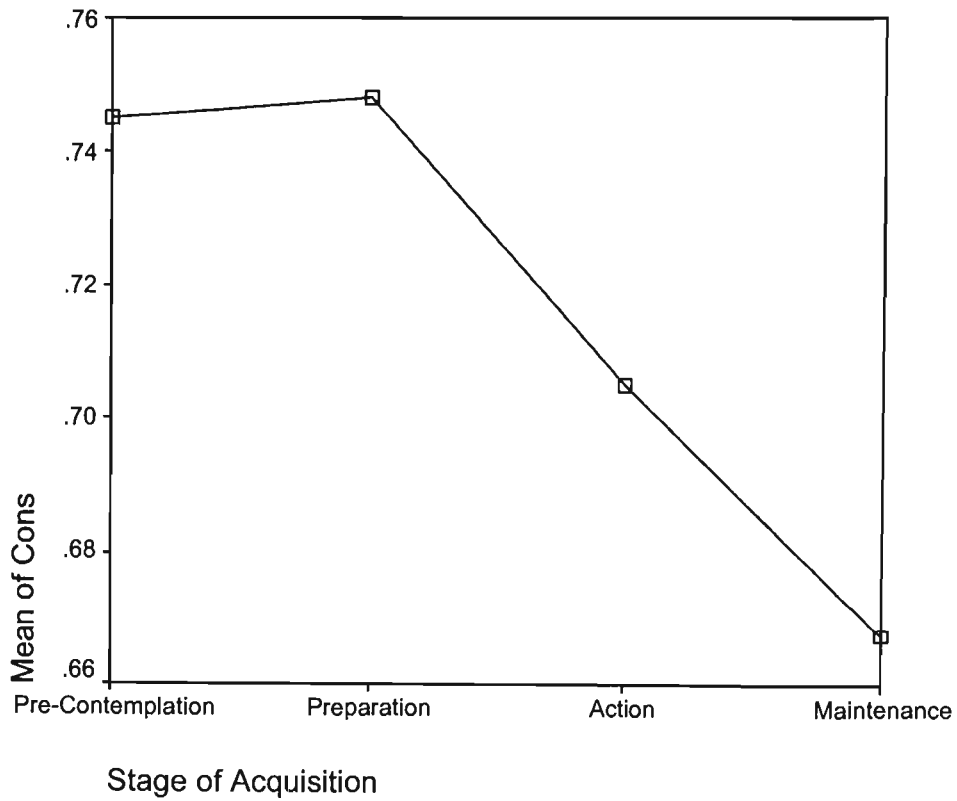
Cons

Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for alpha = .05
Maintenance	34	.6676
Action	30	.7050
Pre-Contemplation	149	.7451
Preparation	68	.7482
Sig.		.148

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 47.527.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Temptation

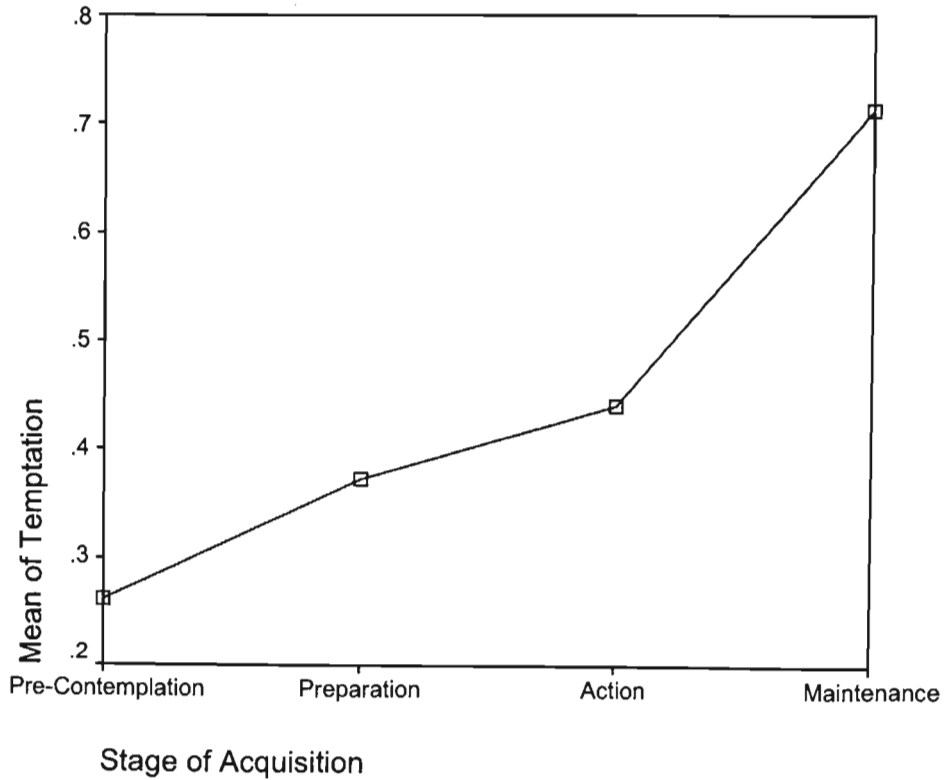
Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for alpha = .05			
		1	2	3	4
Pre-Contemplation	145	.2609			
Preparation	65		.3730		
Action	31			.4412	
Maintenance	32				.7125
Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 46.626.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Social Situations

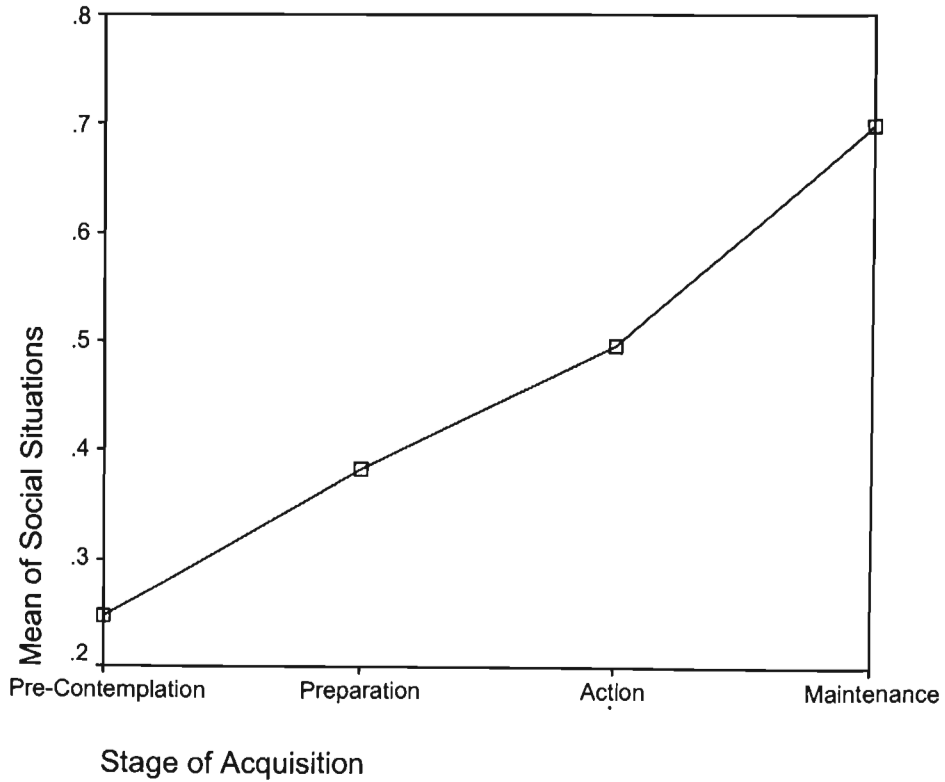
Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for alpha = .05			
		1	2	3	4
Pre-Contemplation	152	.2470			
Preparation	69		.3819		
Action	31			.4952	
Maintenance	34				.6985
Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 48.343.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Affect Regulation

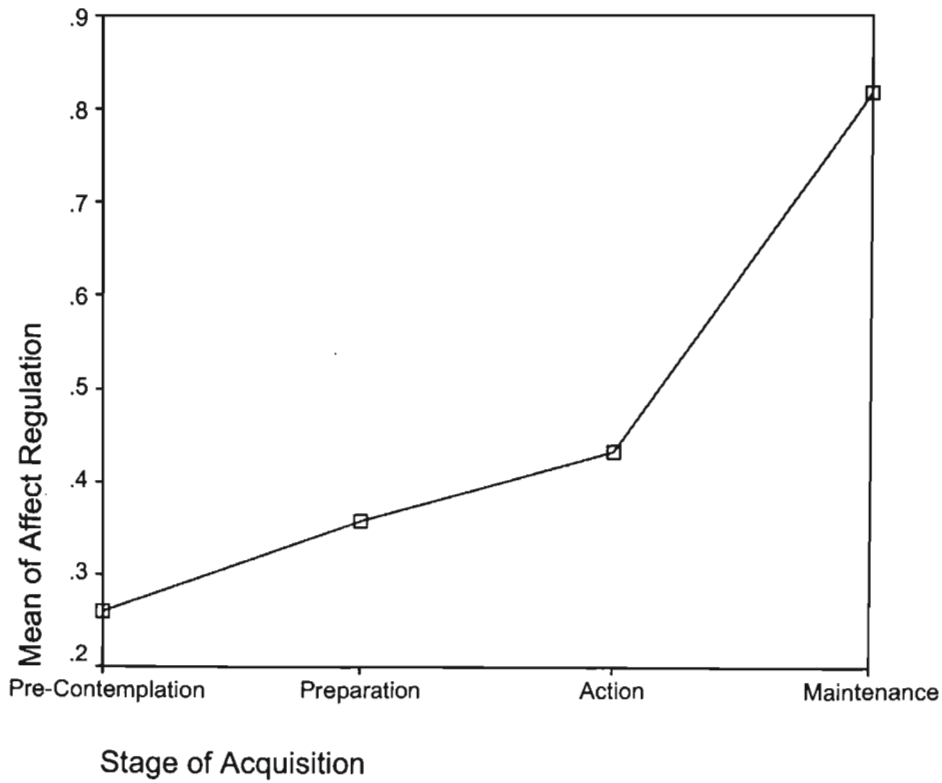
Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for alpha = .05		
		1	2	3
Pre-Contemplation	152	.2613		
Preparation	69		.3571	
Action	31		.4310	
Maintenance	34			.8176
Sig.		1.000	.106	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 48.343.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Boredom

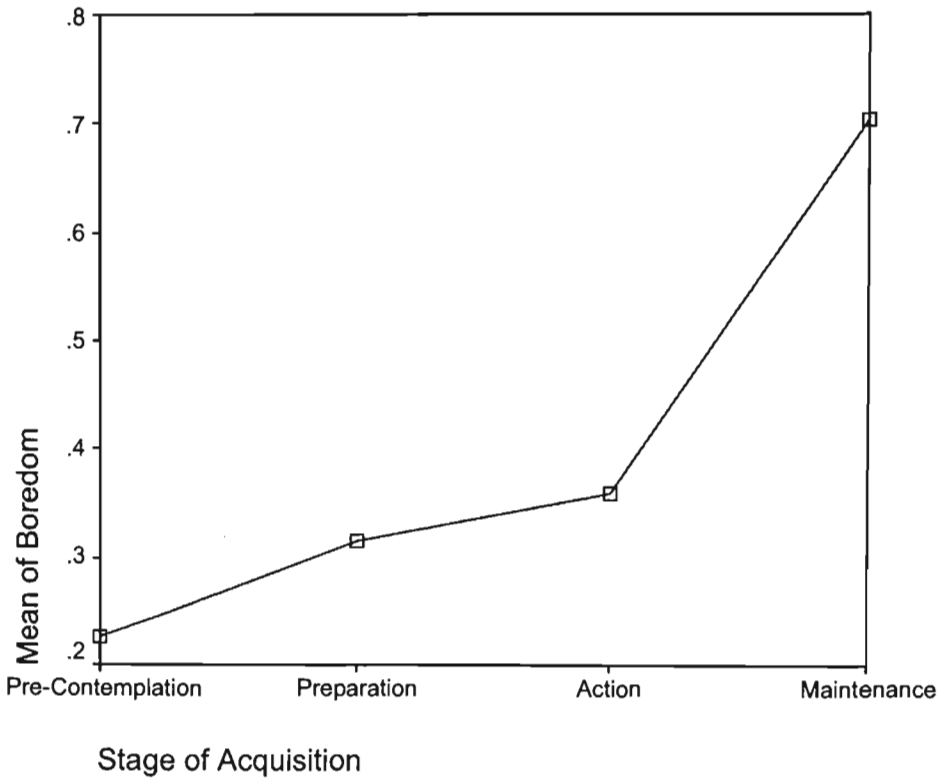
Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for alpha = .05		
		1	2	3
Pre-Contemplation	153	.2268		
Preparation	69		.3159	
Action	31		.3581	
Maintenance	34			.7029
Sig.		1.000	.588	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 48.368.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Curiosity

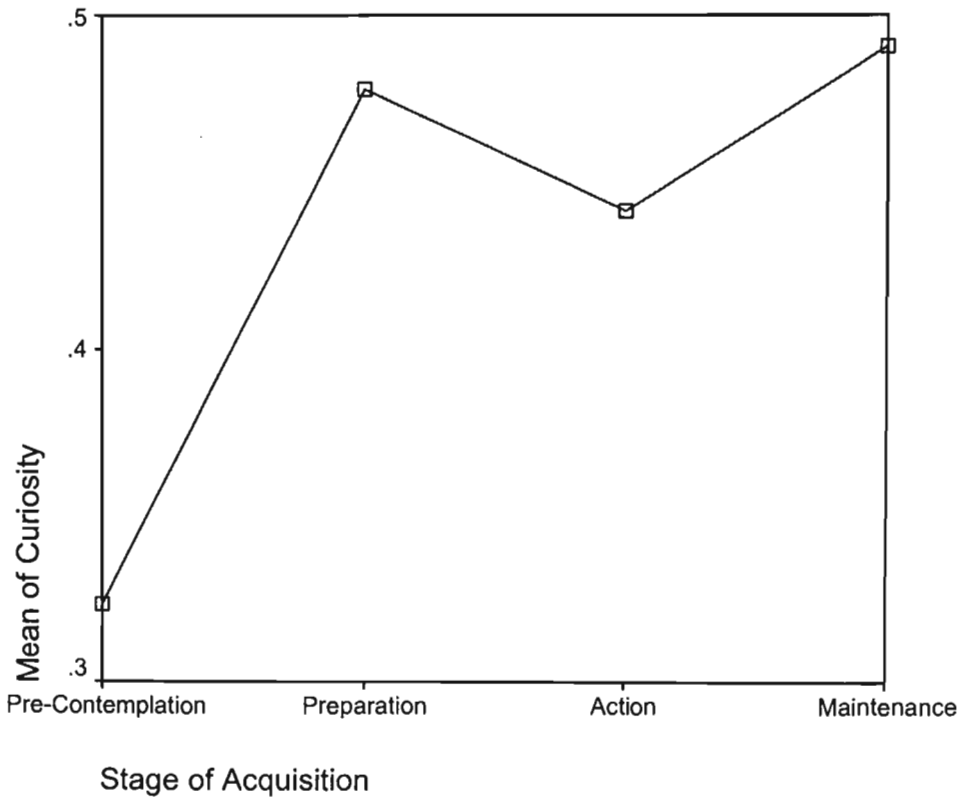
Tukey HSD^{a,b}

Stage of Acquisition	N	Subset for alpha = .05	
		1	2
Pre-Contemplation	146	.3240	
Action	31	.4419	.4419
Preparation	65		.4785
Maintenance	32		.4906
Sig.		.068	.740

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 46.652.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Relationship of Decisional Balance and Temptation

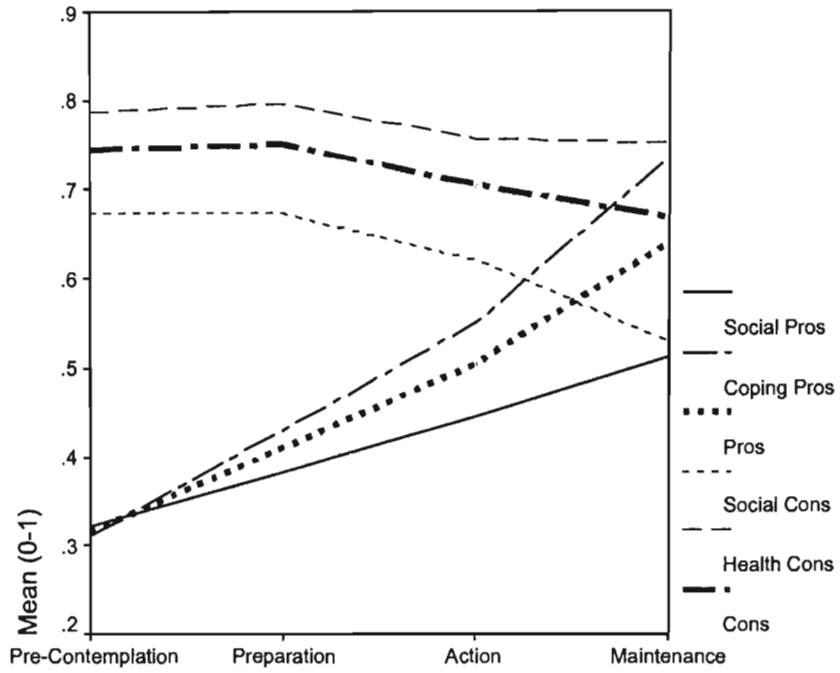


Figure G1: Decisional Balance differences by Stage of Acquisition.

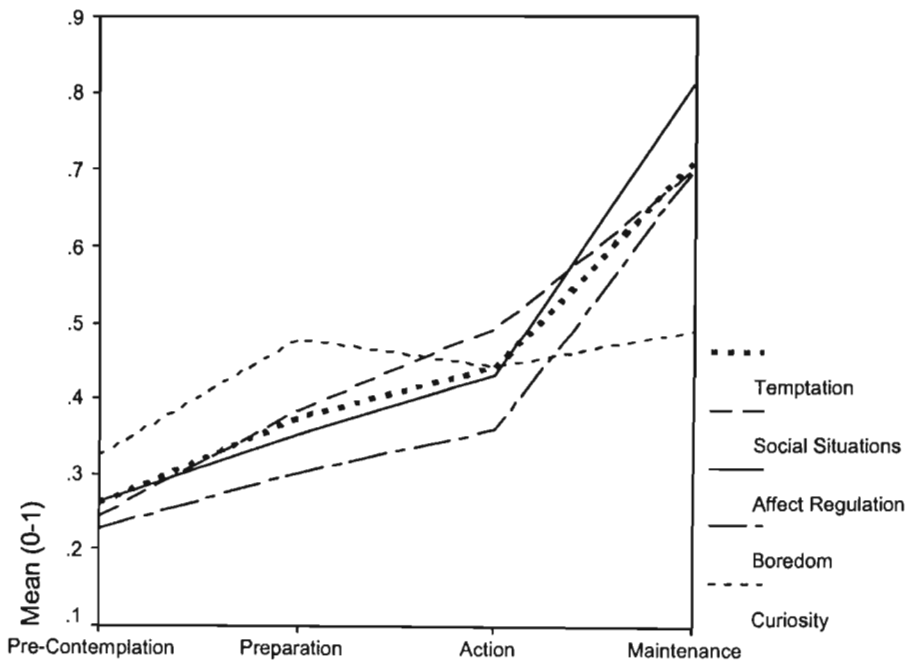


Figure G2: Temptation scores for each Stage of Acquisition.

Appendix H - Differences in Stage According to Demographic Variables

Gender and Language

Sex * Stage of Change * Home Language Crosstabulation

Home Language				Stage of Change				Total
				Pre-Conte mpletion	Preparation	Action	Maintenance	
African	Sex	Male	Count	32	17	8	9	66
			Expected Count	39.1	16.6	5.8	4.5	66.0
		% within Sex	48.5%	25.8%	12.1%	13.6%	100.0%	
		Adjusted Residual	-2.4	.1	1.3	3.0		
	Female	Count	55	20	5	1	81	
		Expected Count	47.9	20.4	7.2	5.5	81.0	
		% within Sex	67.9%	24.7%	6.2%	1.2%	100.0%	
		Adjusted Residual	2.4	-.1	-1.3	-3.0		
	Total	Count	87	37	13	10	147	
		Expected Count	87.0	37.0	13.0	10.0	147.0	
		% within Sex	59.2%	25.2%	8.8%	6.8%	100.0%	
European Origin	Sex	Male	Count	28	11	7	12	58
			Expected Count	27.6	13.1	6.5	10.8	58.0
		% within Sex	48.3%	19.0%	12.1%	20.7%	100.0%	
		Adjusted Residual	.1	-.9	.3	.6		
	Female	Count	31	17	7	11	66	
		Expected Count	31.4	14.9	7.5	12.2	66.0	
		% within Sex	47.0%	25.8%	10.6%	16.7%	100.0%	
		Adjusted Residual	-.1	.9	-.3	-.6		
	Total	Count	59	28	14	23	124	
		Expected Count	59.0	28.0	14.0	23.0	124.0	
		% within Sex	47.6%	22.6%	11.3%	18.5%	100.0%	

Table H1: Contingency Table of sex & stage with African language and European language layers.

Chi-Square Tests

Home Language		Value	df	Asymp. Sig. (2-sided)
African	Pearson Chi-Square	12.010 ^a	3	.007
	Likelihood Ratio	12.923	3	.005
	Linear-by-Linear Association	9.674	1	.002
	N of Valid Cases	147		
European Origin	Pearson Chi-Square	.970 ^b	3	.809
	Likelihood Ratio	.975	3	.807
	Linear-by-Linear Association	.057	1	.811
	N of Valid Cases	124		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 4.49.

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.55.

Table H2: Chi-Square for Sex and Stage.

Symmetric Measures

Home Language			Value	Approx. Sig.
African	Nominal by	Phi	.286	.007
	Nominal	Cramer's V	.286	.007
	N of Valid Cases		147	
European Origin	Nominal by	Phi	.088	.809
	Nominal	Cramer's V	.088	.809
	N of Valid Cases		124	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table H3: Cramer's V strength of association between Sex and Stage. Possible values range between 0 and 1.

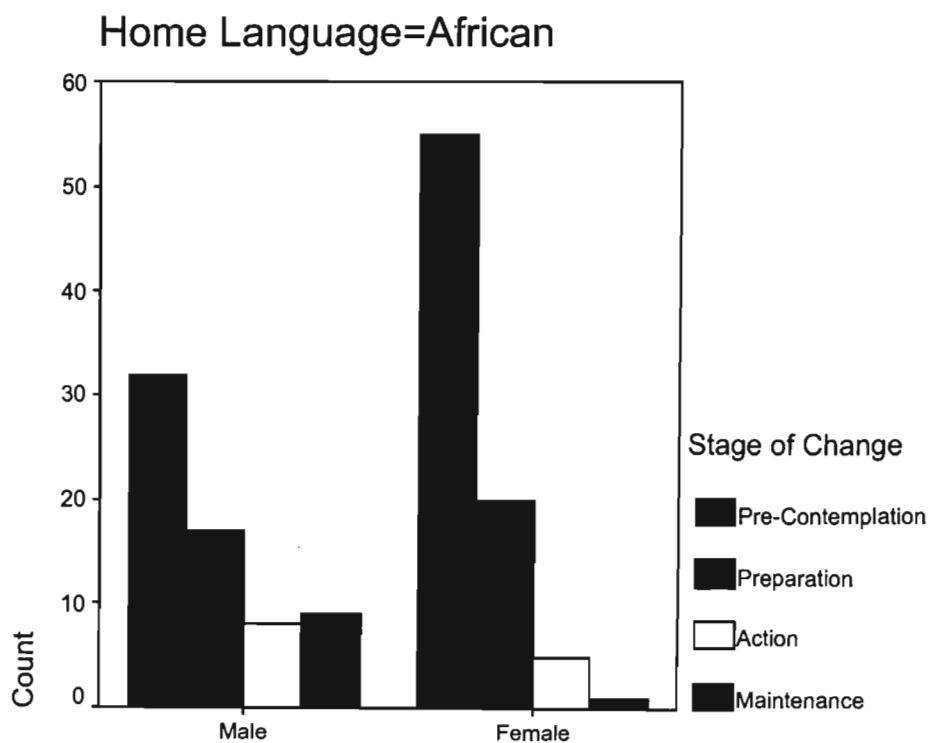


Figure H1: Frequencies of stages for males and females in African language group.

Home Language=European Origin

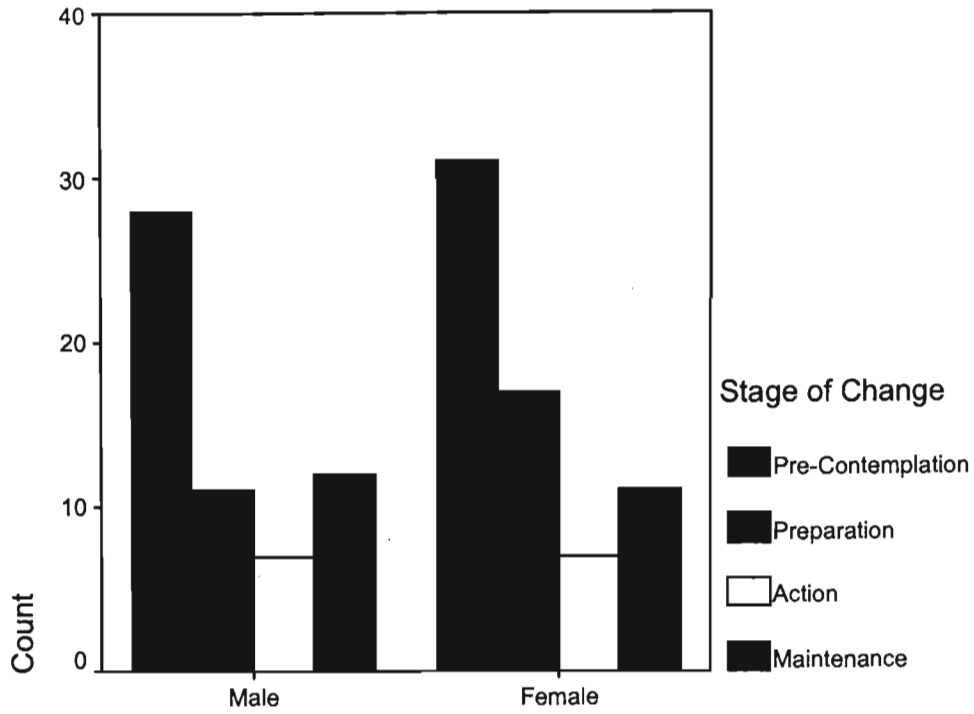


Figure H2: Frequencies of stages for males and females in European language group.

Grade

Crosstab

		Stage of Change				Total	
		Pre-Contemplation	Preparation	Action	Maintenance		
Grade	Grade 9	Count	81	41	15	15	152
		Expected Count	80.7	36.4	16.1	18.7	152.0
		Adjusted Residual	.1	1.3	-.4	-1.3	
Grade	Grade 12	Count	74	29	16	21	140
		Expected Count	74.3	33.6	14.9	17.3	140.0
		Adjusted Residual	-.1	-1.3	.4	1.3	
Total	Count	155	70	31	36	292	
	Expected Count	155.0	70.0	31.0	36.0	292.0	

Table H4: Contingency Table of Stage and Grade.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.917 ^a	3	.405
Likelihood Ratio	2.927	3	.403
Linear-by-Linear Association	.527	1	.468
N of Valid Cases	292		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.86.

Table H5: Chi-Square for Grade and Stage.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.100	.405
	Cramer's V	.100	.405
N of Valid Cases		292	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table H6: Cramer's V strength of association between Grade and Stage.

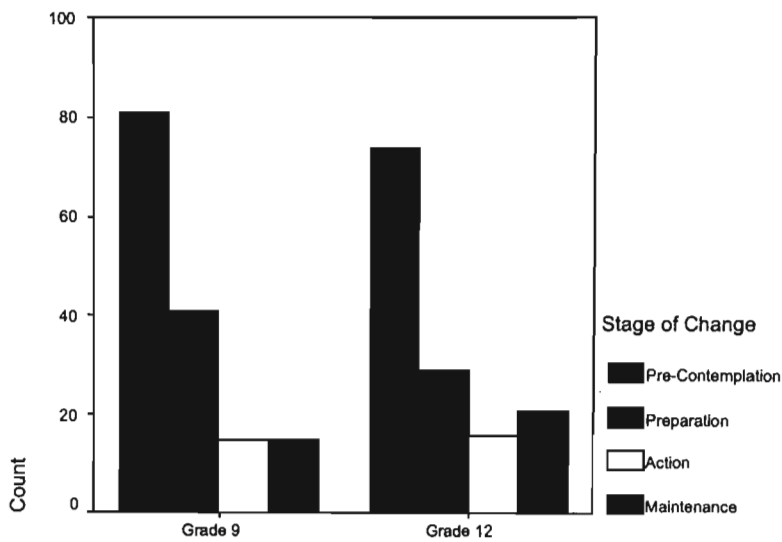


Figure H3: Frequency of Stage for Grade 9 and 12.

Religion

Religion * Stage of Change Crosstabulation

		Stage of Change				Total
		Pre-Contemplation	Preparation	Action	Maintenance	
None	Count	2	2	2	5	11
	Expected Count	6.0	2.4	1.2	1.3	11.0
	Adjusted Residual	-2.5	-.3	.8	3.5	
Christian	Count	122	47	23	19	211
	Expected Count	115.7	46.8	23.0	25.5	211.0
	Adjusted Residual	2.3	.1	.0	-3.6	
Hindu	Count	5	2	0	1	8
	Expected Count	4.4	1.8	.9	1.0	8.0
	Adjusted Residual	.4	.2	-1.0	.0	
African Traditional	Count	5	3	0	1	9
	Expected Count	4.9	2.0	1.0	1.1	9.0
	Adjusted Residual	.0	.8	-1.1	-.1	
Other	Count	2	1	2	4	9
	Expected Count	4.9	2.0	1.0	1.1	9.0
	Adjusted Residual	-2.0	-.8	1.1	3.0	
Total	Count	136	55	27	30	248
	Expected Count	136.0	55.0	27.0	30.0	248.0

Table H7: Contingency Table of Religion and Stage.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.011 ^a	12	.004
Likelihood Ratio	24.773	12	.016
Linear-by-Linear Association	1.041	1	.308
N of Valid Cases	248		

a. 15 cells (75.0%) have expected count less than 5. The minimum expected count is .87.

Table H8: Chi-Square for Religion and Stage. Severe violations of the minimum expected frequency rule.

Symmetric Measures

		Value	Approx. Sig.
Nominal by	Phi	.342	.004
Nominal	Cramer's V	.197	.004
N of Valid Cases		248	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Table H9: Cramer's V strength of association between Religion and Stage.

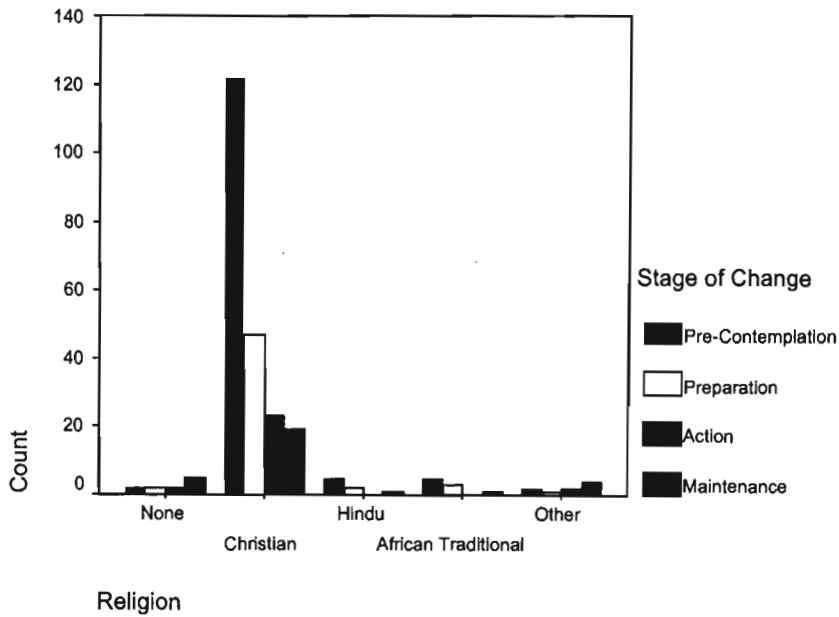


Figure H4: Frequency of Stage for various Religious groups.

Religiosity

ANOVA

How Religious					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	25.516	3	8.505	7.688	.000
Within Groups	283.233	256	1.106		
Total	308.749	259			

Table H10: ANOVA statistic for stage differences due to Religiosity.

Multiple Comparisons

Dependent Variable: How Religious

Tukey HSD

(I) Stage of Change	(J) Stage of Change	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pre-Contemplation	Preparation	-.0303	.16213	.998	-.4496	.3889
	Action	.3928	.22096	.286	-.1786	.9642
	Maintenance	.9166*	.20596	.000	.3839	1.4492
Preparation	Pre-Contemplation	.0303	.16213	.998	-.3889	.4496
	Action	.4231	.24376	.307	-.2072	1.0535
	Maintenance	.9469*	.23025	.000	.3515	1.5423
Action	Pre-Contemplation	-.3928	.22096	.286	-.9642	.1786
	Preparation	-.4231	.24376	.307	-1.0535	.2072
	Maintenance	.5237	.27487	.228	-.1871	1.2345
Maintenance	Pre-Contemplation	-.9166*	.20596	.000	-1.4492	-.3839
	Preparation	-.9469*	.23025	.000	-1.5423	-.3515
	Action	-.5237	.27487	.228	-1.2345	.1871

*. The mean difference is significant at the .05 level.

Table H11: Multiple comparisons between stages indicating sources of variance.

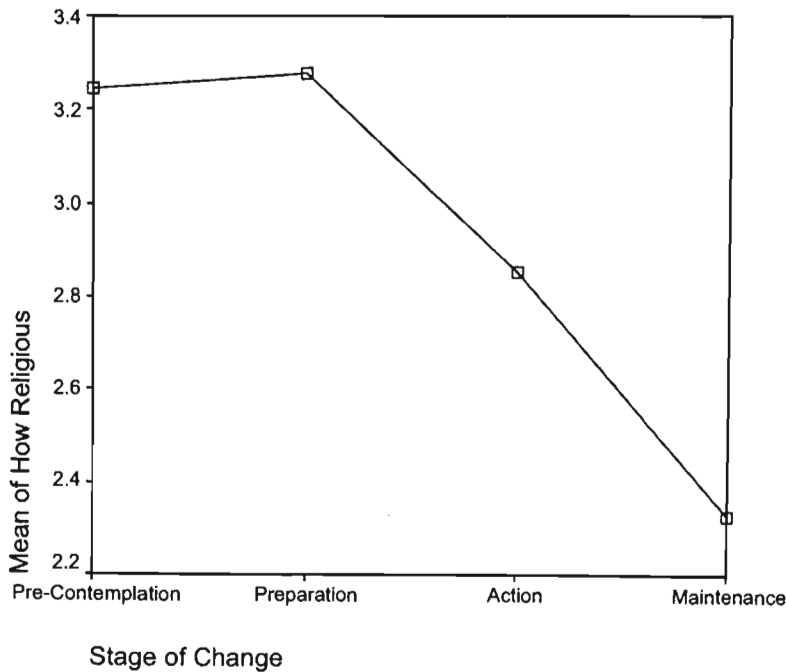


Figure H5: Mean score of Religiosity for each Stage of Acquisition.

School

Crosstab

			Stage of Change				Total
			Pre-Conte mpletion	Preparation	Action	Maintenance	
SCHOOL	A	Count	33	20	8	11	72
		Expected Count	38.2	17.3	7.6	8.9	72.0
		Adjusted Residual	-1.4	.9	.2	.9	
	B	Count	24	12	7	3	46
		Expected Count	24.4	11.0	4.9	5.7	46.0
		Adjusted Residual	-.1	.4	1.1	-1.3	
	C	Count	41	13	7	3	64
		Expected Count	34.0	15.3	6.8	7.9	64.0
		Adjusted Residual	2.0	-.8	.1	-2.1	
	D	Count	57	25	9	19	110
		Expected Count	58.4	26.4	11.7	13.6	110.0
		Adjusted Residual	-.3	-.4	-1.0	2.0	
Total	Count	155	70	31	36	292	
	Expected Count	155.0	70.0	31.0	36.0	292.0	

Table H12: Contingency Table of School and Stage.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.688 ^a	9	.231
Likelihood Ratio	12.504	9	.186
Linear-by-Linear Association	.297	1	.586
N of Valid Cases	292		

a. 1 cells (6.3%) have expected count less than 5. The minimum expected count is 4.88.

Table H13: Chi-Square for School and Stage.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.200	.231
	Cramer's V	.116	.231
N of Valid Cases		292	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table H14: Cramer's V strength of association between School and Stage.

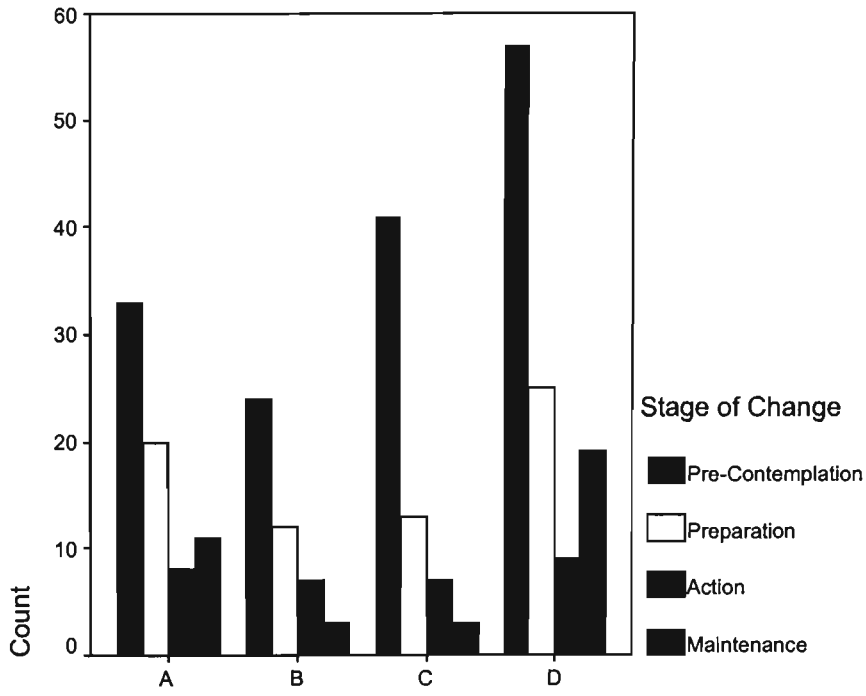


Figure H6: Frequency of Stage for Schools.

Appendix I - Other Associations with Stage

Perceived Social Norms

ANOVA

Perceived Social Norms					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.257	3	.086	5.208	.002
Within Groups	4.597	279	.016		
Total	4.855	282			

Table II: ANOVA statistic for differences between stages due to PSN.

Multiple Comparisons

Dependent Variable: Perceived Social Norms

Tukey HSD

(I) Stage of Acquisition	(J) Stage of Acquisition	Mean Difference (I-J)	Std. Error	Sig.
Pre-Contemplation	Preparation	-.0560*	.01884	.017
	Action	-.0485	.02531	.224
	Maintenance	-.0745*	.02437	.013
Preparation	Pre-Contemplation	.0560*	.01884	.017
	Action	.0075	.02788	.993
	Maintenance	-.0185	.02703	.903
Action	Pre-Contemplation	.0485	.02531	.224
	Preparation	-.0075	.02788	.993
	Maintenance	-.0260	.03188	.847
Maintenance	Pre-Contemplation	.0745*	.02437	.013
	Preparation	.0185	.02703	.903
	Action	.0260	.03188	.847

*. The mean difference is significant at the .05 level.

Table I2: Multiple comparisons between stages on basis of PSN.

Perceived Adult Prevalence

ANOVA

Perceived adult prevalence [/10]

	Sum of Squares	df	Mean Square	F	Sig.	ω^2 Effect Size
Between Groups	27.384	3	9.128	2.326	.075	0.014
Within Groups	1067.423	272	3.924			
Total	1094.807	275				

Table I3: ANOVA statistic for differences between stages due to perceived smokers.

Multiple Comparisons

Dependent Variable: Perceived adult prevalence [/10]

Tukey HSD

(I) Stage of Acquisition	(J) Stage of Acquisition	Mean Difference (I-J)	Std. Error	Sig.
Pre-Contemplation	Preparation	-.70	.295	.084
	Action	.22	.403	.947
	Maintenance	-.26	.373	.893
Preparation	Pre-Contemplation	.70	.295	.084
	Action	.92	.442	.160
	Maintenance	.44	.415	.718
Action	Pre-Contemplation	-.22	.403	.947
	Preparation	-.92	.442	.160
	Maintenance	-.49	.497	.763
Maintenance	Pre-Contemplation	.26	.373	.893
	Preparation	-.44	.415	.718
	Action	.49	.497	.763

Table I4: Multiple comparisons between stages on basis of perceived smokers.

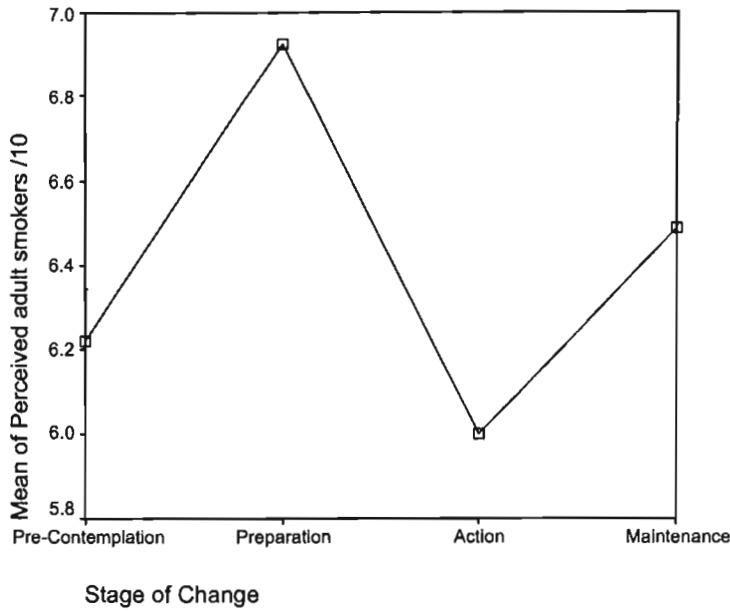


Figure I1: Average perceived adult smokers by Stage.

Parental Smoking

Mother Smoke * Stage of Change * Sex Crosstabulation

Sex				Stage of Change				Total
				Pre-Contemplation	Preparation	Action	Maintenance	
Male	Mother No Smoke	No	Count	56	26	12	18	112
			Expected Count	53.4	25.4	13.1	20.1	112.0
			Adjusted Residual	1.4	.4	-.9	-1.5	
	Yes	Yes	Count	5	3	3	5	16
			Expected Count	7.6	3.6	1.9	2.9	16.0
			Adjusted Residual	-1.4	-.4	.9	1.5	
	Total	Total	Count	61	29	15	23	128
			Expected Count	61.0	29.0	15.0	23.0	128.0
	Female	Mother No Smoke	No	Count	85	28	12	5
Expected Count				77.3	31.4	11.0	10.2	130.0
Adjusted Residual				3.5	-1.8	.8	-4.4	
Yes		Yes	Count	6	9	1	7	23
			Expected Count	13.7	5.6	2.0	1.8	23.0
			Adjusted Residual	-3.5	1.8	-.8	4.4	
Total		Total	Count	91	37	13	12	153
			Expected Count	91.0	37.0	13.0	12.0	153.0

Table I5: Contingency Table of Maternal Smoking & Stage with Genders in layers.

Chi-Square Tests

Sex		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Male	Pearson Chi-Square	3.722 ^a	3	.293	.309
	Likelihood Ratio	3.473	3	.324	.384
	Fisher's Exact Test	3.928			.254
	N of Valid Cases	128			
Female	Pearson Chi-Square	25.738 ^c	3	.000	.000
	Likelihood Ratio	20.892	3	.000	.000
	Fisher's Exact Test	20.831			.000
	N of Valid Cases	153			

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 1.88.

c. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 1.80.

Table I6: Chi-Square for Maternal Smoking and Stage.

Symmetric Measures

Sex			Value	Approx. Sig.	Exact Sig.
Male	Nominal by	Phi	.171	.293	.309
	Nominal	Cramer's V	.171	.293	.309
	N of Valid Cases		128		
Female	Nominal by	Phi	.410	.000	.000
	Nominal	Cramer's V	.410	.000	.000
	N of Valid Cases		153		

Table I7: Cramer's V strength of association between Maternal Smoking and Stage.

A strong positive association (Cramer's V = 0.410) is present in the female layer.

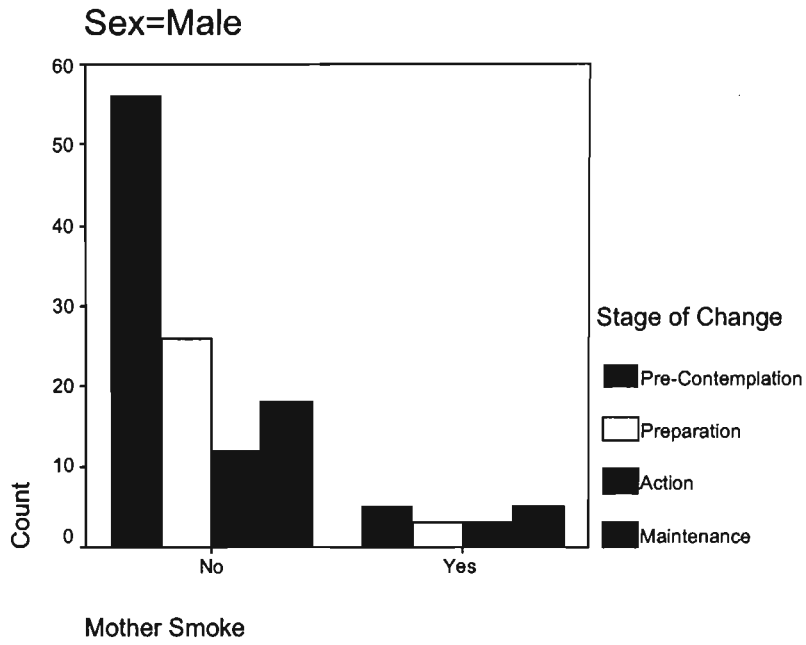


Figure I2: Male Participant Frequency of Stage with Maternal Smoking and Non-smoking.

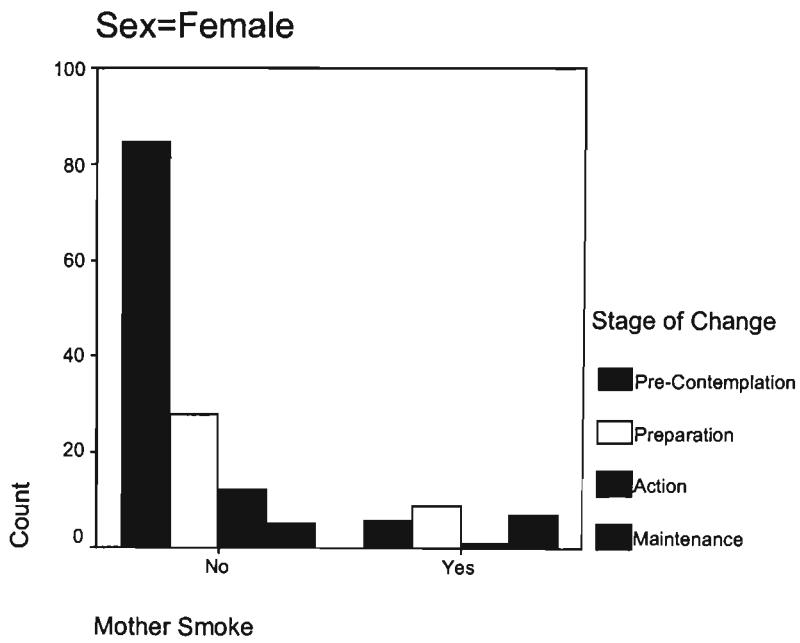


Figure I3: Female Participant Frequency of Stage with Maternal Smoking and Non-smoking.

Father Smoke * Stage of Change * Sex Crosstabulation

Sex			Stage of Change				Total
			Pre-Contemplation	Preparation	Action	Maintenance	
Male	Father Smoke No	Count	47	21	9	16	93
		Expected Count	46.1	19.7	10.6	16.6	93.0
		Adjusted Residual	.4	.7	-1.0	-.3	
	Yes	Count	14	5	5	6	30
		Expected Count	14.9	6.3	3.4	5.4	30.0
		Adjusted Residual	-.4	-.7	1.0	.3	
	Total	Count	61	26	14	22	123
		Expected Count	61.0	26.0	14.0	22.0	123.0
	Female	Father Smoke No	Count	66	23	9	8
Expected Count			61.6	26.5	9.3	8.6	106.0
Adjusted Residual			1.6	-1.5	-.2	-.4	
Yes		Count	20	14	4	4	42
		Expected Count	24.4	10.5	3.7	3.4	42.0
		Adjusted Residual	-1.6	1.5	.2	.4	
Total		Count	86	37	13	12	148
		Expected Count	86.0	37.0	13.0	12.0	148.0

Table I8: Contingency Table of Paternal Smoking & Stage with Genders in layers.

Chi-Square Tests

Sex		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Male	Pearson Chi-Square	1.516 ^a	3	.678	.689
	Likelihood Ratio	1.455	3	.693	.701
	Fisher's Exact Test	1.645			.659
	N of Valid Cases	123			
Female	Pearson Chi-Square	2.921 ^c	3	.404	.419
	Likelihood Ratio	2.871	3	.412	.436
	Fisher's Exact Test	3.138			.372
	N of Valid Cases	148			

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.41.

c. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.41.

Table I9: Chi-Square for Paternal Smoking and Stage.

The association between paternal smoking and Stage of Acquisition is not significant for males or females.

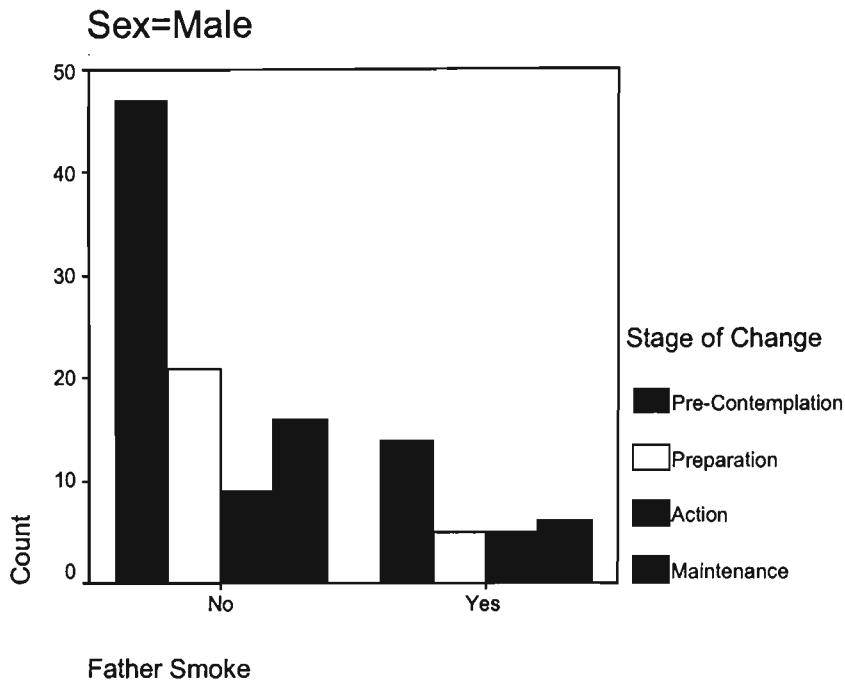


Figure I4: Male Participant Frequency of Stage with Paternal Smoking and Non-smoking.

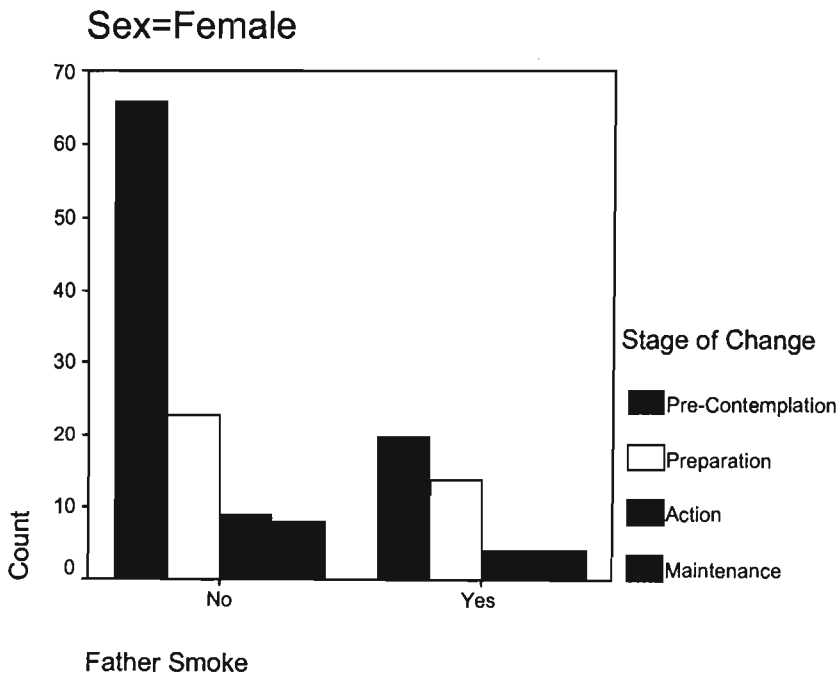


Figure I5: Female Participant Frequency of Stage with Paternal Smoking and Non-smoking.

Alcohol Use

Robust Tests of Equality of Means

Alcohol per week

	Statistic(a)	df1	df2	Sig.	ω^2 Effect Size
Welch	3.770	3	75.164	.014	0.115

a Asymptotically F distributed.

Table I10: Welch statistic for differences between stages due to alcohol use.

Multiple Comparisons

Dependent Variable: Alcohol units per week

Tukey HSD

(I) Stage of Change	(J) Stage of Change	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pre-Contemplation	Preparation	-.64	.761	.832	-2.61	1.32
	Action	-.84	1.040	.849	-3.53	1.84
	Maintenance	-6.19*	.998	.000	-8.78	-3.61
Preparation	Pre-Contemplation	.64	.761	.832	-1.32	2.61
	Action	-.20	1.145	.998	-3.16	2.76
	Maintenance	-5.55*	1.107	.000	-8.41	-2.69
Action	Pre-Contemplation	.84	1.040	.849	-1.84	3.53
	Preparation	.20	1.145	.998	-2.76	3.16
	Maintenance	-5.35*	1.314	.000	-8.75	-1.95
Maintenance	Pre-Contemplation	6.19*	.998	.000	3.61	8.78
	Preparation	5.55*	1.107	.000	2.69	8.41
	Action	5.35*	1.314	.000	1.95	8.75

*. The mean difference is significant at the .05 level.

Table I11: Multiple comparisons between stages on basis of alcohol use.

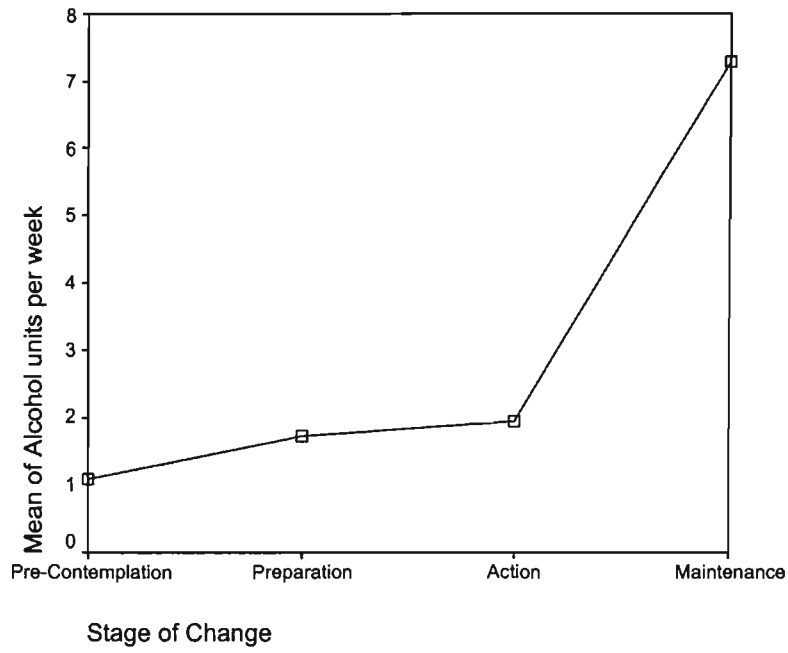


Figure I6: Mean Alcohol Units Consumed per week per Stage.

Appendix J - Relationship of demographics to Decisional Balance, Temptation and Perceived Social Norms.

Grade

Test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
Social Pros	.084	1	285	.772
Coping Pros	.309	1	283	.579
Pros	.007	1	283	.931
Social Cons	3.381	1	283	.067
Health Cons	.044	1	280	.834
Cons	.145	1	279	.704
Perceived Social Norms	5.215	1	281	.023
Temptation	.582	1	271	.446
Social Situations	.182	1	284	.670
Affect Regulation	1.987	1	284	.160
Boredom	4.136	1	285	.043
Curiosity	10.455	1	272	.001

Table J1: Test for Homogeneity of Variances using Levene’s Statistic.

Robust Tests of Equality of Means						
		Statistic(a)	df1	df2	Sig.	ω^2 Effect Size
Perceived Social Norms	Welch	5.259	1	278.969	.023	0.043
Boredom	Welch	2.381	1	284.753	.124	-0.008
Curiosity	Welch	9.892	1	268.165	.002	0.011

a Asymptotically F distributed.

Table J2: Welch statistic for differences between stages due to Grade.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.	ω^2 Effect Size
Social Pros	Between Groups	.004	1	.004	.133	.715	-0.003
	Within Groups	8.195	285	.029			
	Total	8.199	286				
Coping Pros	Between Groups	.031	1	.031	.698	.404	-0.001
	Within Groups	12.774	283	.045			
	Total	12.806	284				
Pros	Between Groups	.015	1	.015	.482	.488	-0.002
	Within Groups	8.619	283	.030			
	Total	8.634	284				
Social Cons	Between Groups	.245	1	.245	6.284	.013	0.018
	Within Groups	11.031	283	.039			
	Total	11.276	284				
Health Cons	Between Groups	.019	1	.019	.458	.499	-0.002
	Within Groups	11.732	280	.042			
	Total	11.751	281				
Cons	Between Groups	.060	1	.060	1.747	.187	0.003
	Within Groups	9.602	279	.034			
	Total	9.662	280				
Temptation	Between Groups	.086	1	.086	2.420	.121	0.005
	Within Groups	9.654	271	.036			
	Total	9.740	272				
Social Situations	Between Groups	.049	1	.049	1.162	.282	0.001
	Within Groups	12.101	284	.043			
	Total	12.151	285				
Affect Regulation	Between Groups	.023	1	.023	.417	.519	-0.002
	Within Groups	15.877	284	.056			
	Total	15.900	285				

Table J3: ANOVA statistic for differences between stages due to Grade.

Grade 9 respondents consistently scored higher than grade 12s on all of the tested measures.

School

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Social Pros	.672	3	283	.570
Coping Pros	1.105	3	281	.348
Pros	1.211	3	281	.306
Social Cons	.989	3	281	.398
Health Cons	2.348	3	278	.073
Cons	1.918	3	277	.127
Perceived Social Norms	6.323	3	279	.000
Temptation	2.587	3	269	.053
Social Situations	2.749	3	282	.043
Affect Regulation	.506	3	282	.679
Boredom	5.739	3	283	.001
Curiosity	4.164	3	270	.007

Table J4: Test for Homogeneity of Variances using Levene’s Statistic.

Robust Tests of Equality of Means

		Statistic(a)	df1	df2	Sig.	ω^2 Effect Size
Social Pros	Welch	1.096	3	137.707	.353	0.002
Coping Pros	Welch	2.097	3	133.045	.104	0.009
Pros	Welch	2.002	3	134.022	.117	0.008
Social Cons	Welch	.741	3	134.262	.530	-0.003
Health Cons	Welch	.166	3	133.797	.919	-0.009
Cons	Welch	.270	3	133.943	.847	-0.008
Perceived Social Norms	Welch	12.207	3	131.368	.000	0.079
Temptation	Welch	1.659	3	131.298	.179	0.004
Social Situations	Welch	1.566	3	134.457	.201	0.003
Affect Regulation	Welch	.310	3	133.837	.818	-0.008
Boredom	Welch	2.176	3	139.133	.094	0.011
Curiosity	Welch	1.493	3	132.508	.219	0.003

a Asymptotically F distributed.

Table J5: Welch statistic for differences between Stages due to School.

Perceived Social Norms

Tukey HSD^{a,b}

School	N	Subset for alpha = .05		
		1	2	3
C	64	.4536		
B	46	.4807	.4807	
A	66		.5364	.5364
D	107			.5471
Sig.		.610	.060	.962

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 64.661.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table J6: Homogenous subsets of schools on Perceived Social Norms scores.

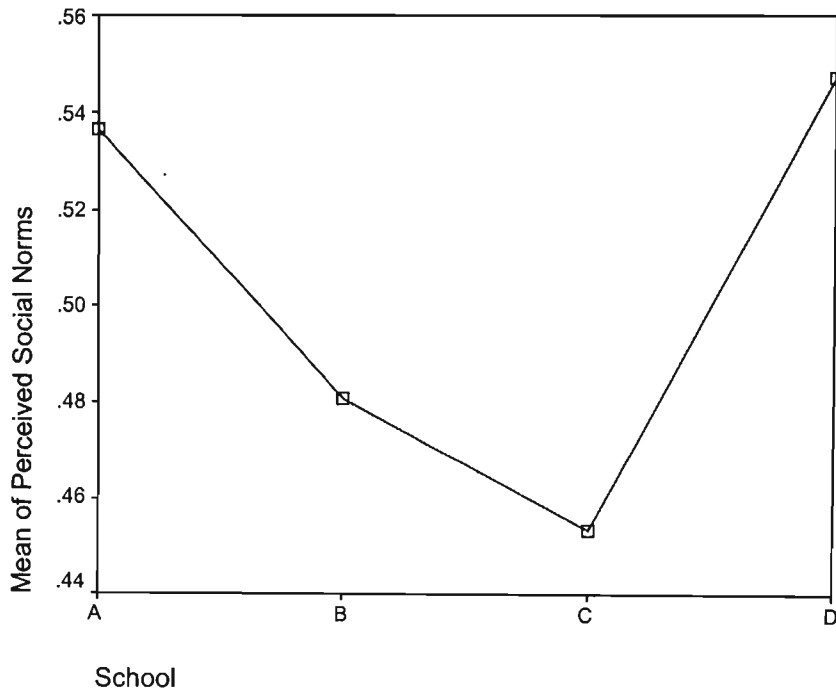


Figure J1: Mean Perceived Social Norms score for Schools.

Gender

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Social Pros	.254	1	278	.615
Coping Pros	1.013	1	276	.315
Pros	.787	1	276	.376
Social Cons	1.744	1	276	.188
Health Cons	1.213	1	273	.272
Cons	1.602	1	272	.207
Perceived Social Norms	1.063	1	274	.304
Temptation	.944	1	264	.332
Social Situations	.531	1	277	.467
Affect Regulation	.634	1	277	.427
Boredom	.157	1	278	.692
Curiosity	1.529	1	265	.217

Table J7a: Test of Homogeneity of Variances for Gender

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.	ω^2 Effect Size
Social Pros	Between Groups	.024	1	.024	.851	.357	-0.001
	Within Groups	7.956	278	.029			
	Total	7.980	279				
Coping Pros	Between Groups	.103	1	.103	2.280	.132	0.005
	Within Groups	12.413	276	.045			
	Total	12.516	277				
Pros	Between Groups	.066	1	.066	2.184	.141	0.004
	Within Groups	8.359	276	.030			
	Total	8.425	277				
Social Cons	Between Groups	.004	1	.004	.104	.747	-0.003
	Within Groups	10.938	276	.040			
	Total	10.942	277				
Health Cons	Between Groups	.007	1	.007	.180	.671	-0.003
	Within Groups	11.261	273	.041			
	Total	11.268	274				
Cons	Between Groups	.003	1	.003	.089	.766	-0.003
	Within Groups	9.295	272	.034			
	Total	9.298	273				
Perceived Social Norms	Between Groups	.037	1	.037	2.200	.139	0.004
	Within Groups	4.652	274	.017			
	Total	4.689	275				
Temptation	Between Groups	.024	1	.024	.670	.414	-0.001
	Within Groups	9.594	264	.036			
	Total	9.619	265				
Social Situations	Between Groups	.020	1	.020	.458	.499	-0.002
	Within Groups	11.945	277	.043			
	Total	11.965	278				
Affect Regulation	Between Groups	.053	1	.053	.936	.334	0.000
	Within Groups	15.701	277	.057			
	Total	15.754	278				
Boredom	Between Groups	.010	1	.010	.202	.653	-0.003
	Within Groups	13.666	278	.049			
	Total	13.676	279				
Curiosity	Between Groups	.033	1	.033	.549	.459	-0.002
	Within Groups	15.800	265	.060			
	Total	15.833	266				

Table J7: ANOVA statistics for differences between Genders.

Language

Test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
Social Pros	.128	1	268	.720
Coping Pros	18.046	1	267	.000
Pros	13.124	1	267	.000
Social Cons	.051	1	266	.821
Health Cons	2.191	1	263	.140
Cons	.331	1	262	.566
Perceived Social Norms	1.945	1	265	.164
Temptation	24.196	1	255	.000
Social Situations	18.498	1	267	.000
Affect Regulation	29.592	1	267	.000
Boredom	17.883	1	268	.000
Curiosity	2.279	1	256	.132

Table J8: Levene's Test for Homogeneity of Variances.

		Statistic(a)	df1	df2	Sig.	ω^2 Effect Size
Social Pros	Welch	1.013	1	261.592	.315	0.000
Coping Pros	Welch	9.345	1	227.532	.003	0.031
Pros	Welch	6.488	1	235.022	.012	0.021
Social Cons	Welch	1.709	1	255.560	.192	0.003
Health Cons	Welch	.004	1	262.983	.951	-0.004
Cons	Welch	.417	1	261.082	.519	-0.002
Perceived Social Norms	Welch	.041	1	247.592	.839	-0.004
Temptation	Welch	12.589	1	217.806	.000	0.045
Social Situations	Welch	9.854	1	232.226	.002	0.033
Affect Regulation	Welch	16.960	1	224.210	.000	0.059
Boredom	Welch	7.103	1	225.232	.008	0.023
Curiosity	Welch	2.232	1	244.493	.136	0.005

Table J9: Welch statistic for differences between measures due to Language.

European language speakers scored higher on all statistically significant differences.

Religion

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Social Pros	1.371	4	240	.245
Coping Pros	.707	4	239	.588
Pros	.215	4	239	.930
Social Cons	1.848	4	238	.120
Health Cons	.920	4	236	.453
Cons	1.304	4	235	.269
Perceived Social Norms	.973	4	237	.423
Temptation	2.047	4	231	.089
Social Situations	4.455	4	239	.002
Affect Regulation	1.842	4	240	.122
Boredom	2.212	4	240	.068
Curiosity	3.191	4	231	.014

Table J10: Levene’s Test for Homogeneity of Variances.

Robust Tests of Equality of Means

		Statistic(a)	df1	df2	Sig.	ω^2 Effect Size
Social Pros	Welch	1.735	4	17.395	.188	0.014
Coping Pros	Welch	2.962	4	17.469	.049	0.045
Pros	Welch	2.746	4	17.276	.062	0.036
Social Cons	Welch	1.225	4	18.898	.334	0.005
Health Cons	Welch	.300	4	18.041	.874	-0.011
Cons	Welch	.768	4	18.153	.560	-0.005
Perceived Social Norms	Welch	.121	4	17.693	.973	-0.015
Temptation	Welch	2.283	4	16.594	.104	0.059
Social Situations	Welch	1.983	4	17.054	.143	0.050
Affect Regulation	Welch	2.696	4	17.336	.065	0.052
Boredom	Welch	1.337	4	17.074	.297	0.023
Curiosity	Welch	.240	4	16.643	.912	-0.009

a Asymptotically F distributed.

Table J11: Welch statistic for differences between measures due to Religion.

Tables J12-18: The following tables indicate the homogenous subsets of religions.

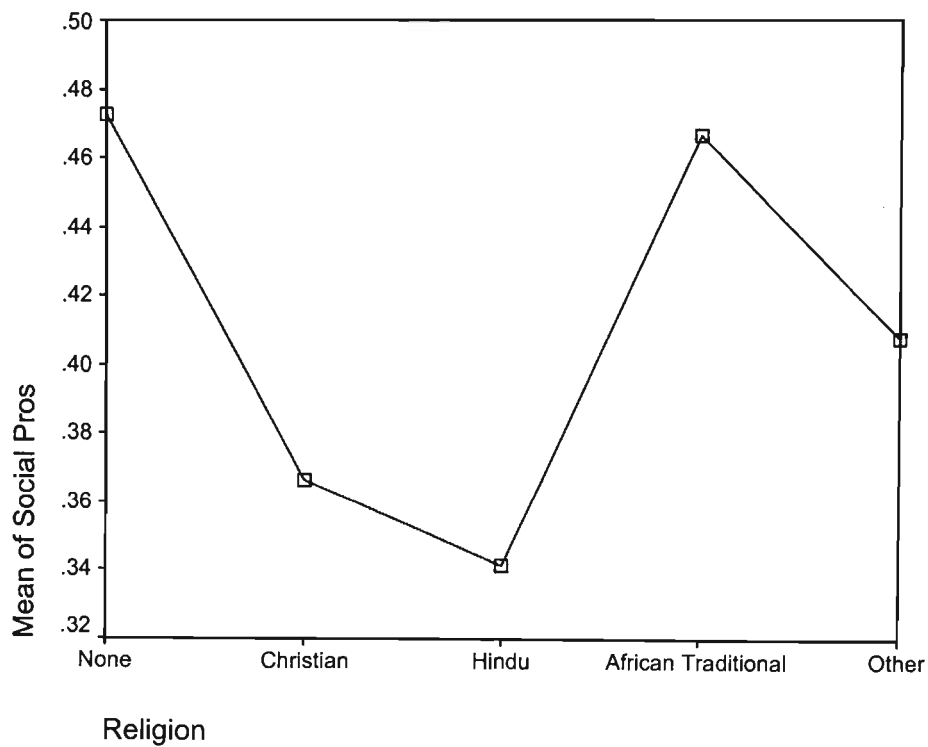
Social Pros

Tukey HSD^{a,b}

Religion	N	Subset for alpha = .05
Hindu	8	.3417
Christian	208	.3667
Other	9	.4074
African Traditional	9	.4667
None	11	.4727
Sig.		.358

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 11.288.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



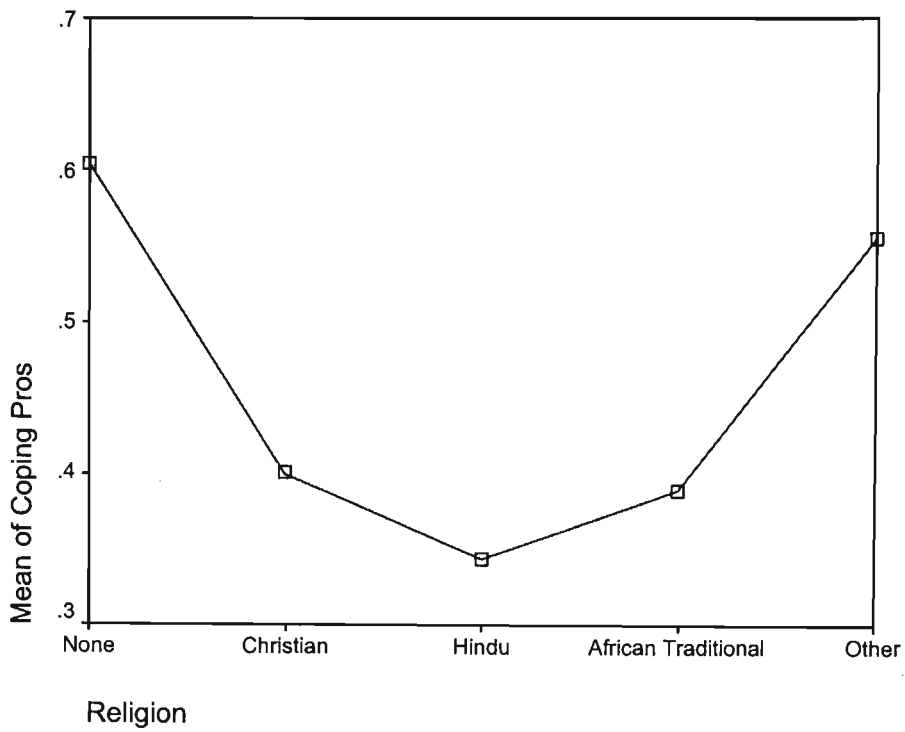
Coping Pros

Tukey HSD^{a,b}

Religion	N	Subset for alpha = .05	
		1	2
Hindu	8	.3438	
African Traditional	9	.3889	.3889
Christian	207	.4000	.4000
Other	9	.5556	.5556
None	11		.6045
Sig.		.112	.101

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 11.288.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Pros

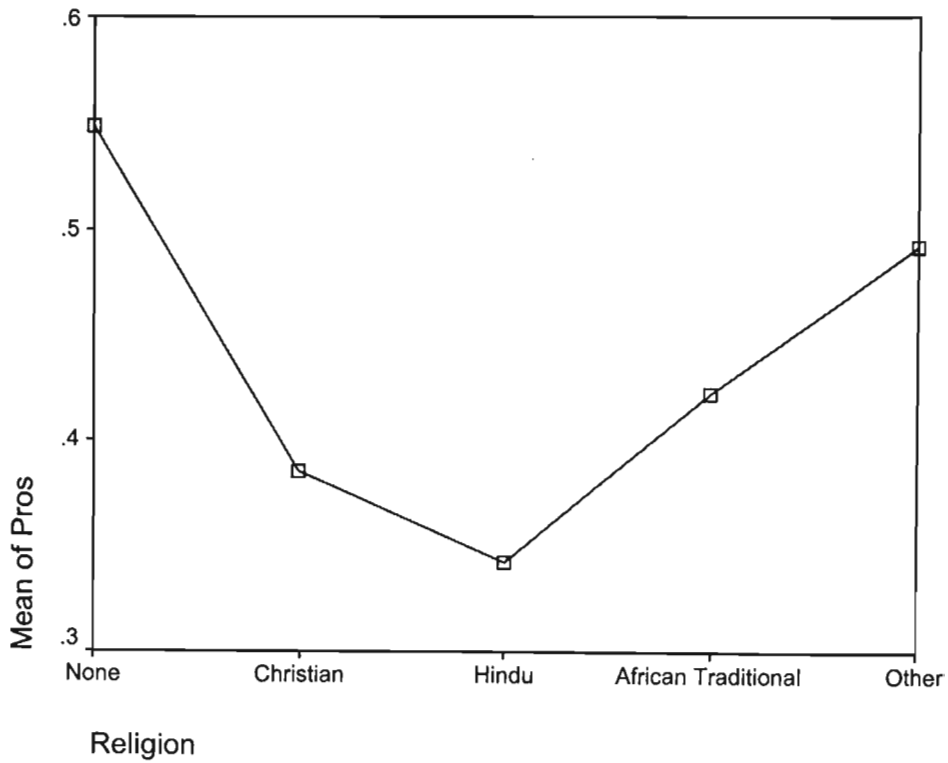
Tukey HSD^{a,b}

Religion	N	Subset for alpha = .05	
		1	2
Hindu	8	.3429	
Christian	207	.3855	.3855
African Traditional	9	.4222	.4222
Other	9	.4921	.4921
None	11		.5481
Sig.		.240	.166

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 11.288.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Social Cons

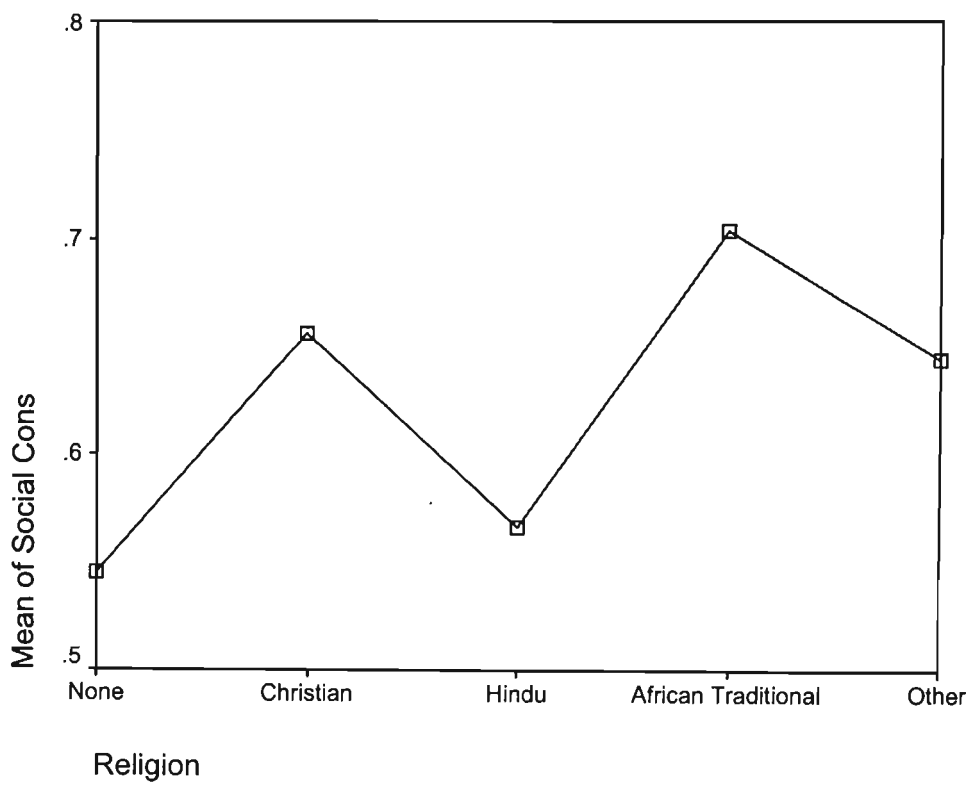
Tukey HSD^{a,b}

Religion	N	Subset for
		alpha = .05
None	11	.5455
Hindu	8	.5667
Other	9	.6444
Christian	206	.6560
African Traditional	9	.7037
Sig.		.324

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 11.287.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



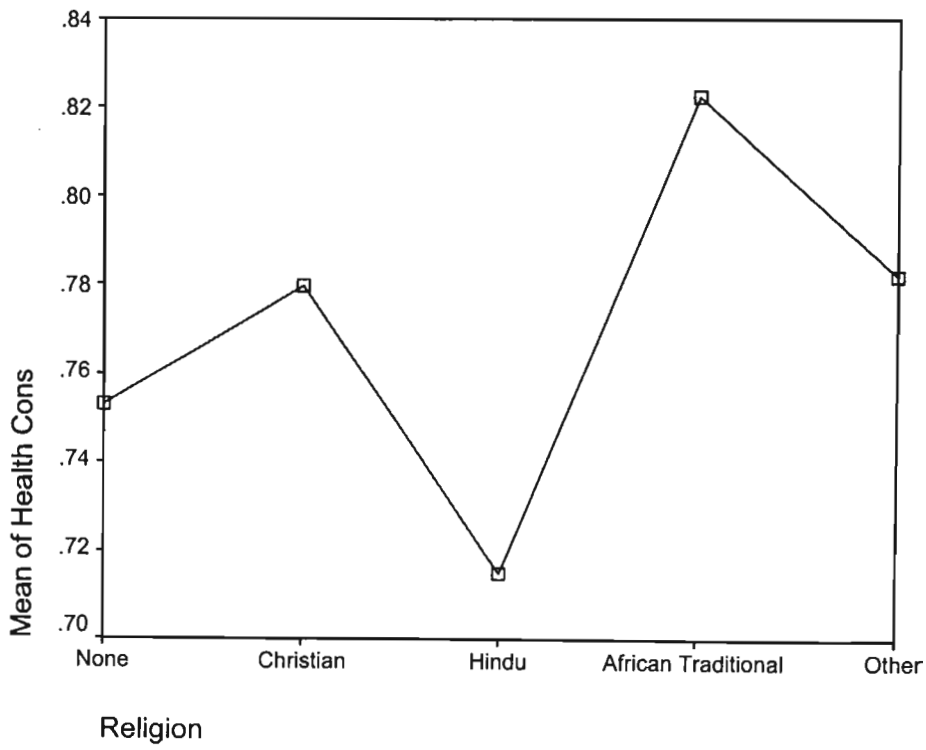
Health Cons

Tukey HSD^{a,b}

Religion	N	Subset for
		alpha = .05
		l
Hindu	8	.7150
None	11	.7527
Christian	204	.7796
Other	9	.7822
African Traditional	9	.8222
Sig.		.726

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 11.286.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Cons

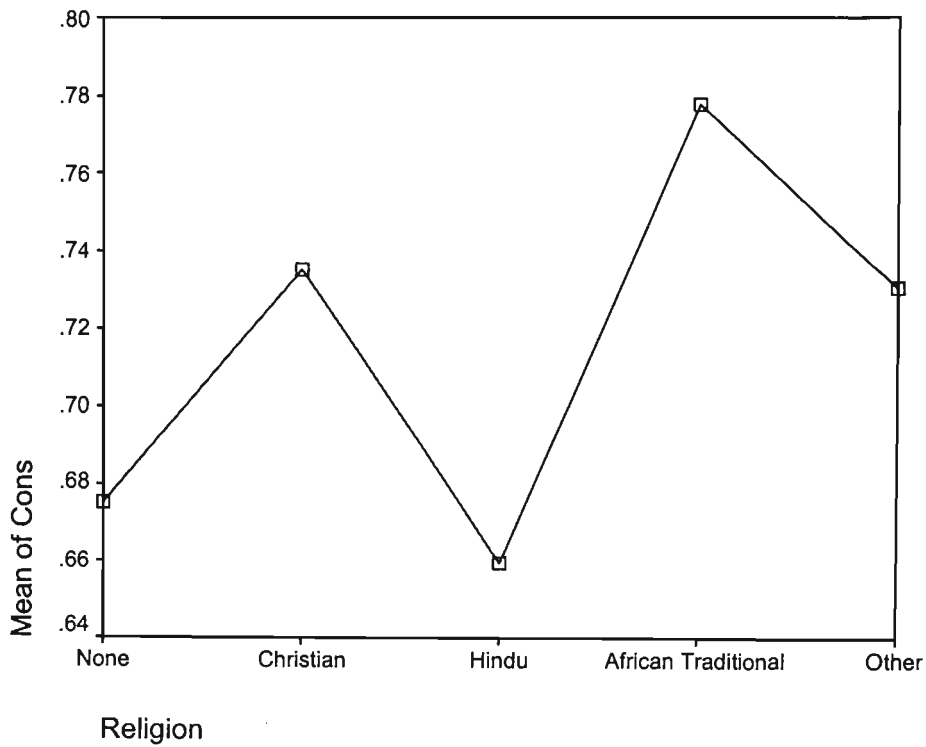
Tukey HSD^{a,b}

Religion	N	Subset for
		alpha = .05
Hindu	8	.6594
None	11	.6750
Other	9	.7306
Christian	203	.7355
African Traditional	9	.7778
Sig.		.555

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 11.285.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



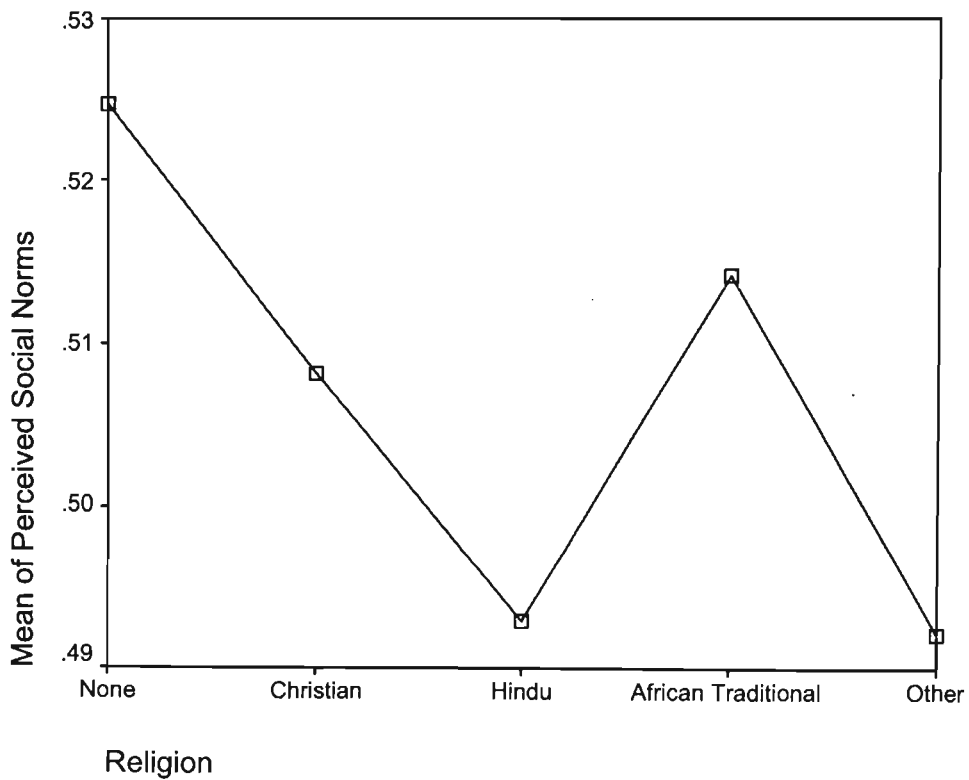
Perceived Social Norms

Tukey HSD^{a,b}

Religion	N	Subset for alpha = .05
Other	9	.4921
Hindu	8	.4929
Christian	205	.5082
African Traditional	9	.5143
None	11	.5247
Sig.		.973

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 11.286.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



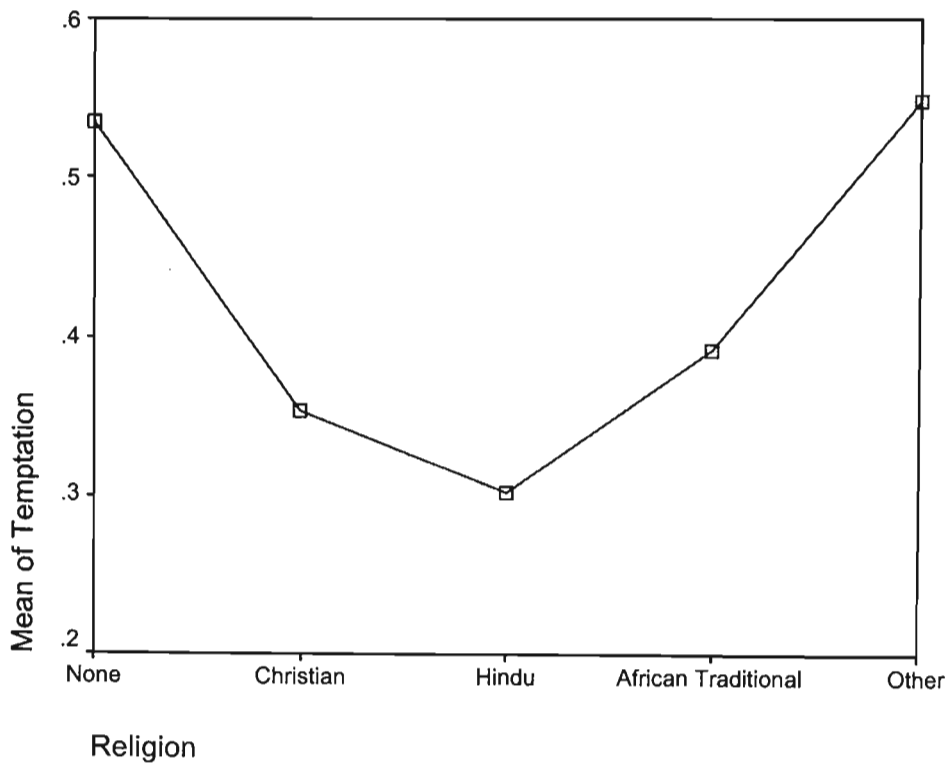
Temptation

Tukey HSD^{a,b}

Religion	N	Subset for alpha = .05	
		1	2
Hindu	8	.3019	
Christian	200	.3538	.3538
African Traditional	9	.3915	.3915
None	10		.5354
Other	9		.5487
Sig.		.790	.103

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 11.057.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



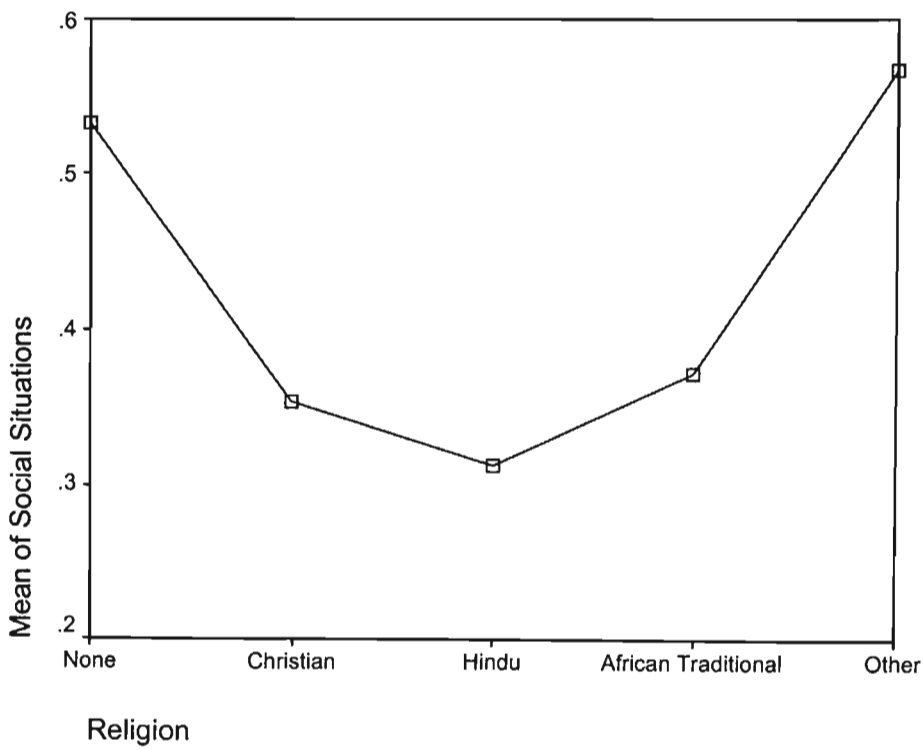
Social Situations

Tukey HSD^{a,b}

Religion	N	Subset for alpha = .05	
		1	2
Hindu	8	.3125	
Christian	207	.3536	.3536
African Traditional	9	.3722	.3722
None	11	.5318	.5318
Other	9		.5667
Sig.		.088	.105

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 11.288.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Affect Regulation

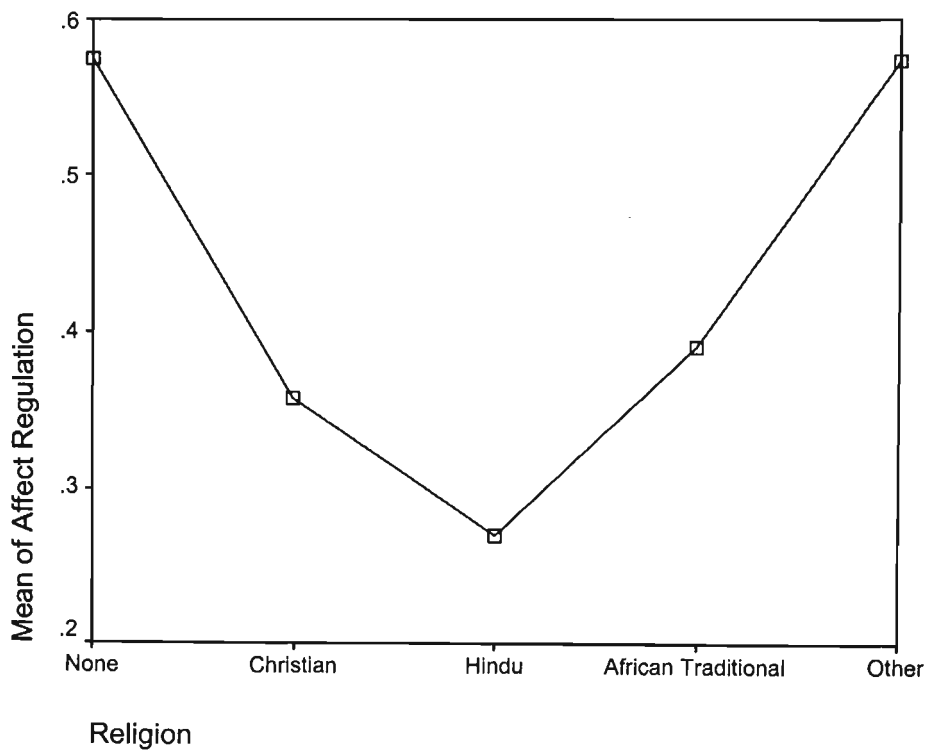
Tukey HSD^{a,b}

Religion	N	Subset for alpha = .05	
		1	2
Hindu	8	.2700	
Christian	208	.3583	.3583
African Traditional	9	.3911	.3911
Other	9		.5733
None	11		.5745
Sig.		.728	.178

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 11.288.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



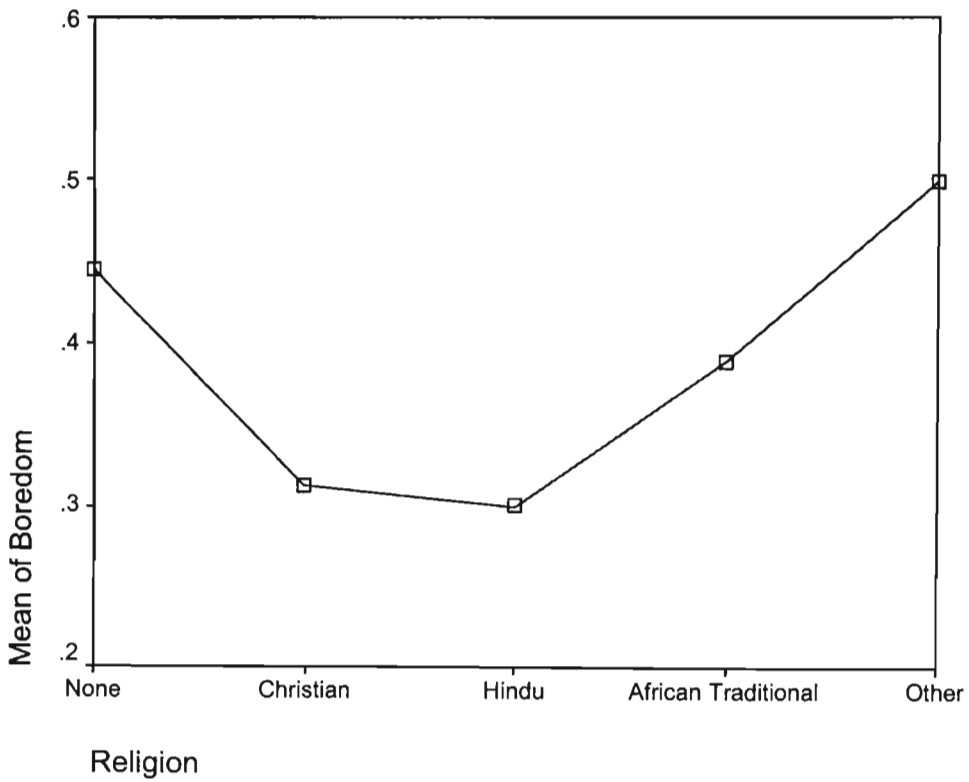
Boredom

Tukey HSD^{a,b}

Religion	N	Subset for
		alpha = .05
Hindu	8	.3000
Christian	208	.3125
African Traditional	9	.3889
None	11	.4455
Other	9	.5000
Sig.		.231

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 11.288.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.



Curiosity

Tukey HSD^{a,b}

Religion	N	Subset for
		alpha = .05
		l
Hindu	8	.3625
Christian	200	.3965
None	10	.4300
African Traditional	9	.4333
Other	9	.5000
Sig.		.685

Means for groups in homogeneous subsets are displayed.

- a. Uses Harmonic Mean Sample Size = 11.057.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

