School-based smoking prevention intervention for Saudi male adolescents

Citation for published version (APA):

Document status and date:
Published: 01/01/2022

DOI:
10.26481/dis.20220330mm

Document Version:
Publisher's PDF, also known as Version of record

Please check the document version of this publication:
• A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
• The final author version and the galley proof are versions of the publication after peer review.
• The final published version features the final layout of the paper including the volume, issue and page numbers.

Link to publication

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the “Taverne” license above, please follow below link for the End User Agreement:
www.umlib.nl/taverne-license

Take down policy
If you believe that this document breaches copyright please contact us at:
repository@maastrichtuniversity.nl
providing details and we will investigate your claim.

Download date: 22 Mar. 2022
School-Based Smoking Prevention Intervention for Saudi Male Adolescents

Mutaz Abdelbagi Hasabelrasoul Mohammed
The research presented in this thesis was conducted at the Maastricht Care and Public Health Research Institute: CAPHRI, Department of Health Promotion, of the Maastricht University. CAPHRI which participates in the, Netherlands School of Primary Care Research (CaRe) acknowledged in 1995 by the Royal Dutch Academy of Science (KNAW).
Contents

List of figures ................................................................. 7
List of tables ................................................................. 7

Chapter 1 General introduction ................................................... 9

Chapter 2 Towards a better understanding of factors affecting smoking uptake among Saudi male adolescents: A qualitative study ................................................................. 31

Chapter 3 Smoking uptake among Saudi adolescents, tobacco epidemic indicators and preventive actions needed ................................................................. 53
Chapter 4  Factors associated with smoking initiation among Saudi male adolescents: A longitudinal study .......................................................................................................................... 71

Chapter 5  Effects of a randomized controlled trial to assess the six-month effects of a school-based smoking prevention programme in Saudi Arabia ........................................ 89
Chapter 6  General discussion

Introduction .................................
Preparation for the programme's development ............................................................
Theoretical framework (the I-Change Model).........................................................
Intervention goal and objectives...........................................................................
Identification of salient beliefs..................................................................................
Factors associated with smoking initiation among Saudi male adolescents: A longitudinal study
The school-based smoking prevention programme ..............................................
Design of the school-based smoking prevention programme ........................
Preferred didactics.................................................................................................
Effect evaluation of the school-based smoking prevention programme............... Comparison with other studies ..............................................................
Lessons learnt: What went well and what could be improved? ..............................
Other approaches..................................................................................................
Challenges encountered.........................................................................................
Methodological issues...........................................................................................
Implications for smoking prevention and future research in Saudi Arabia
Recommendations for tobacco control programmes in Saudi Arabia

Summary .....................................................................................................................
Samenvatting ...........................................................................................................
Impact of the research ...........................................................................................
Propositions.............................................................................................................
Acknowledgement. .................................................................................................
Curriculum vitae ....................................................................................................
List of publications.................................................................................................
List of figures

Chapter 1

Chapter 5

List of tables

Chapter 2

Chapter 3

Chapter 4

Chapter 5
Chapter 5

Table 1: The description of the intervention programme.

Table 2: Sample characteristics at baseline and differences between the experimental and control group.

Table 3: Means, standard deviations and differences of socio-cognitive factors at baseline.

Table 4: Mean differences in socio-cognitive factors between follow-up and baseline (T2-T1).

Table 5: Summary of programme evaluation by participants.

Chapter 6

Table 1: The behaviour change methods and techniques used in the intervention programme.
CHAPTER 1
General introduction
Introduction

Tobacco smoking (TS) is one of the major global public health problems. Although many efforts have been made to minimize TS among all age groups, especially adolescents, it remains the leading cause of preventable death worldwide (World Health Organization [WHO], 2015). It is associated with more than seven million deaths each year and was projected to have caused 10 million deaths each year by the end of 2020. Half of today’s smokers, about 650 million people, will eventually be killed by tobacco (Feigin et al., 2016; WHO, 2017b). The economic costs are prodigious, including the loss of productivity each year (WHO, 2017a). In addition to the high public health burden of managing smoking-related diseases, TS victims are less productive due to increased and repeated morbidity events and often die prematurely, depriving families and nations of a healthy workforce (USDHHS, 2013).

The exact date of tobacco’s introduction into Saudi Arabia (SA) and its neighbouring countries is unknown. However, it is assumed that smoking became popular at the beginning of the 18th century (Hamadeh, 1998). In a review study on prevalence, Basiony (2009) looked at 34 studies, which investigated the epidemiology of TS in SA, the prevalence among school students (16.5%) and among university students (13.5%). TS among adult males ranged from 13% to 38% of the population (mean=25.5), while among adult females TS ranged from 1% to 16% (mean=8.5%). As can be noted from these figures, smoking among females is much less common than among males, a finding supported by a recent review of smoking prevalence and its determinants (Alasqah, Mahmud, East, & Usher, 2019). Possible reasons are that males are more often encouraged to spend free time with their peers than females. Reasons for the lower prevalence of smoking among females may be that they are strictly supervised by parents and older brothers (Abdalla, Al-fergany, Idris, Al-Hajri, & Al-Manahers, 2010; WHO, 2010).

Worldwide TS prevention programmes have involved diverse approaches, including community-based and family-based approaches, media campaigns, and school-based interventions (Lantz et al., 2000). Important advantages of school-based smoking prevention programmes are that...
General introduction

The target group can be easily approached, students are a group vulnerable to smoking onset, and early intervention has been proven to be an effective strategy. School-based TS prevention programmes following a social influence approach have been implemented over the last 40 years, and have been shown to be successful up to 24 months, certainly when they are embedded in a more comprehensive approach (Thomas, McLennan, & Pera, 2015).

However, these effects tend to decay over time (Susman, Black, & Rohrbach, 2010). In a study with a 12-year follow-up (the Hutchinson Smoking Prevention Project), it was concluded that there is little or no evidence that a school-based approach is effective in the long-term detection of smoking among youth (Peterson, Kealey, Mann, Market, & Sarasohn, 2000). Other studies, such as the ASSIST trial, concluded that this approach can be effective and have long-lasting effects if certain conditions are met (Melanby, Rees, & Tripp, 2000).

An intervention using a social influence approach that incorporates activities enhancing refusal and peer-pressure coping, rather than only giving information about smoking and effects.

The intervention offers an interactive learning approach in which young people are not only passive recipients of an intervention but become active participants in the process. Peers are used as programme leaders.

The programme supports the development of personal and social skills, training students to deal with peer pressure and to realize sufficient levels of self-efficacy in order to be able to refrain from smoking, and should foster decision-making and cognitive skill development so students can resist interpersonal or media influences.

With 53 randomized controlled trials included, a systematic review and meta-analysis assessed the effectiveness of four types of interventions used in school-based smoking prevention curricula: information, social influences, social competence, combined social influences/social competence, and multimodal curricula. The reviewers concluded that all types were effective in the short term (≤ one year), while combined social competence/social influences curricula showed a significant effect in both follow-up periods, in the short and the long term (Thomas et al., 2015).

The social influence approach using social inoculation was first introduced by Evans in the late 1970s (Evans et al., 1978). Social influence can be described as processes whereby people directly or indirectly influence the thoughts, feelings, and actions of others (de Vries, Backbier, Kok, & Dijkstra, 1995). Many studies and reviews have documented the effect of family members, friends, and peers on health;
Chapter 1

Peer and significant others on smoking behaviour of adolescents, either directly or indirectly. The influence approach has previously been applied in intervention studies in the United States, aimed at understanding the determinants of smoking behaviour and used a social cognitive model, the Integrated Model for behaviour change (Change Model). It showed that this model is effective in investigating and explaining the smoking behaviour of adolescents in the Middle East (Farajat, 2010). Smokers in this region have a more positive attitude towards smoking than non-smokers. Smokers demonstrated more positive social influences encouraging them to smoke than non-smokers. They more often perceived social norms from their siblings, peers, and teachers that encouraged smoking. Additionally, smokers reported more smokers in their direct social environment, including siblings.

In order to understand the uptake of smoking among youngsters in settings where smoking determinants are not well investigated, qualitative research methods can be used to deepen our understanding of the problem as well as generate ideas, concepts, and theories that contribute to understanding the problem. In addition, qualitative methods will aid the formulation of ideas for improvement of relevant factors (Eggers, 2016). Where we have been successful in the UK (Caulfeild, Milsom, & Tickle, 2015) and in South Africa to assess the determinants of programmes (Panday, Reddy, & Bergström, 2003; Swart, Panday, Reddy, Bergström, & de Vries, 2006), and to investigate perceptions of sexual risk (Morrow, Brook, & Kachieng’a, 2006).
General introduction

Bcher aoui et al., 2014) signed the World Health Organization Framework Convention on Tobacco Control in 2005 (Moradi-Lakeh et al., 2015), implementing that SA is committed to achieving the main goal of the convention: ‘To protect present and future generations from the devastating health, social, environmental and economic consequences of tobacco consumption and exposure to tobacco smoke’ (WHO, 2003, p. 5). The adoption of supportive policies for tobacco control programmes would also include prevention. Regrettably, the prevention scope is limited in SA’s tobacco control programme. There has been a lack of analyses on why children start smoking, and smoking prevention programmes have not been systematically developed and tested (Jarrallah, Al-Rubeaan, Al-Nuai m, Al-Ruhi l y, & Kalant an, 1999). Moreover, although several initiatives for TS cessation have been implemented to help people quit, these initiatives have hardly been subjected to effect evaluation (Alhobeira, Siddiqui, & Mian, 2018; Alsamghan et al., 2017). For example, to the social aspects of TS behaviour (Almutairi, 2014; Ashraf Nazir & Almas, 2017). Despite

Determinants of TS and smoking onset predictors

The at titude of adolescents towards TS, which is determined by several perceived advantages (e.g. pleasant, tasty, helps with being slim, helps get the attention of others, helps with...
and peers; the perceived pressure by others to smoke in addition to adolescents’ ability to cope with others’ social norms and expectations about whether adolescents should smoke;

- The self-efficacy of an adolescent concerning the ability not to smoke in different situations, for instance when with friends who smoke, when offered a cigarette by a friend or a significant other, when on the way home, or when watching TV;

- Intent, which is considered the most proximal determinant of behavior in many theoretical models, and overall motivation factors contribute to the intent to practice TS, as mentioned by Kelis hadi et al., 2016).

Sociodemographic factors may also be related to adolescents’ smoking behavior (Cremer et al., 2018), smoking onset increases with age (Thompson, Mower, Tebes, & McKee, 2018), and in certain cultures (certainly Arab culture), more males than females smoke (Abdal l a et al., 2007). Demographic factors are related to smoking onset, and the assumption of sociocognitive models is that these factors are reflected in differences in attitudes, perceived social influence, and self-efficacy expectations. In this thesis, we investigate which factors are associated with TS among Saudi male adolescents. The outcomes are discussed in detail in the third chapter of this thesis. These outcomes also provided the basis for the development of the prevention programme discussed later in this thesis.

Overview of Saudi Arabia

SA (Figure 1) lies at the furthest part of SouthWest Asia, east of the Red Sea and west of the Arabian Gulf. It is bordered to the north by Kuwait, Iraq, and Jordan, to the south by Yemen and
General introduction

Saudi Arabia is relatively young, with about 31% under 15 years (General Authority of Statistics, 2018). With regard to educational system management, SA is divided into 13 educational areas, following the political system that divides the kingdom into 13 districts. The educational system is gender-specific, with boys and girls in separate schools following separate curricula.

Islam is the only religion officially practiced in SA. The primary sources of Islamic law are the Qur’an and the way and practice of the Prophet Muhammad. Islam covers all aspects of life, and the Islamic position on issues is derived from the aforementioned primary sources by religious scholars (Radwan et al., 2003). They thus clarify for people whether a matter, which can be health-related, is compulsory, permissible, forbidden, or disliked. With regard to TS, some Islamic scholars have concluded that it is forbidden (haram) based on the fact that smoking has been proven to cause illness and mortality (Juni, 2014).

Figure 1: Map of Saudi Arabia.

Source: https://www.infoplease.com/atlas/middle-east/saudi-arabia-map
Chapter 1

In this project, we followed the step-wise approach of the pragmatic methodology (Cheung, Hor-Fraile, & de Vries, 2021), which starts with choosing the theoretical model, followed by setting the goal and objective of the programme. Next, salient beliefs were identified using the literature, qualitative and quantitative research was conducted, and the process was concluded by designing, implementing, and evaluating the intervention programme. We used qualitative research to inform quantitative research in order to design the intervention aimed at changing smoking behaviour. We first conducted a qualitative study so as to explore the views of adolescents on smoking behaviour, the validity of the quantitative research questionnaire, and adolescents’ preferences regarding the...

Theoretical framework

which is based on the ASE model (de Vries, Kremers, Smeets, Brug, & Eijmael, 2008; de Vries, ...
behaviours in different countries with different cultures (de Vries, Mudde, Kremers, et al. 2003; Farajat, 2010; Holm, Kremers, & de Vries, 2003; Lotrean et al., 2010; Panday, 2010). In all these studies, the ESFA questionnaire was reported to be reliable and valid for assessing smoking behaviour among adolescents in many European countries (de Vries, Dijk et al., 2006; de Vries, Mudde, Leis, et al. 2003; Holm, Kremers, & de Vries, 2003; Lotrean et al., 2010).

The questionnaires used in this thesis are based on the European Smoking prevention Framework Approach (ESFA), which was previously used to assess and influence smoking behaviour among adolescents in many European countries (de Vries, Dijk et al., 2006; de Vries, Mudde, Leis, et al. 2003; Holm, Kremers, & de Vries, 2003; Lotrean et al., 2010).

**Figure 2: The I-Change Model.**
Chapter 1

Goal and objectives of the intervention

Most interventions applied in SA with the goal of reducing TS lack published evaluations. Little is known about the motivational factors that endear TS to adolescents. Therefore, school-based smoking prevention programmes with evaluations of their effectiveness are highly needed. This dissertation describes the development, implementation, and evaluation of a school-based smoking prevention programme. The overall goal of our project is to prevent smoking initiation among Saudi male adolescents. The dissertation has the following objectives:

1) To explore adolescents’ views on smoking and their opinions about a smoking prevention programme (Chapter 2).
2) To investigate whether social cognitive models, such as the I-Change Model, can be fruitfully applied in order to understand and change the smoking behaviour of Saudi adolescents (Chapters 3, 4, and 5).
3) To determine demographic differences between smokers and non-smokers (Chapter 3).
4) To assess differences between smokers and non-smokers in terms of attitude, perceived social influences, self-efficacy, and intention concerning smoking (Chapters 3 and 4).
5) To study whether the resulting programme change adolescents’ attitudes towards non-smoking in a positive direction and whether the programme is able to strengthen adolescents’ self-efficacy in terms of resisting social pressure, modelling, and norms (Chapter 5).
6) To study the effects of the programme on smoking onset (Chapter 5).

Study setting

Taif is one of three provinces in the western region of SA. In Taif, there are 354 schools for boys, 20% of which (73 schools) are secondary schools. These schools account for 20,208 (26%) of a total population of 77,852 students in the province. The study included only boys, because the educational system is gender-specific and smoking is officially not considered a problem for schoolgirls (Abdalla et al., 2009). Moreover, funding was not available to develop an approach targeting girls. To explore Saudi male adolescents’ ideas on smoking behaviour,
General introduction

To investigate differences between smokers and non-smokers and assess the determinants of TS among adolescents, a cross-sectional study was conducted. To get to know predictors of smoking initiation, a longitudinal study was used. Finally, to evaluate the anti-smoking intervention programme, a randomized controlled study, with 10 schools randomly selected for the experimental group and nine schools for the control group, was conducted.

Outline of this thesis

Chapter 2 elaborates on the qualitative study, provides an analysis of focus group discussions, describes the different views of Saudi male adolescents on why they smoke or do not smoke, and explains their preference regarding a smoking prevention intervention programme.

Chapter 3 describes a quantitative study concerning the determinants of smoking. This chapter outlines the factors related to smoking behaviour among adolescents and assesses the need for an anti-smoking intervention programme. The cross-sectional study included 695 respondents from the seventh, eighth, and ninth grades and aimed to determine demographic, attitudinal, perceived social influences, self-efficacy, and intention differences between smokers and non-smokers. It also describes whether the factors of the I-Change Model are suitable for understanding TS behaviour in SA.

Chapter 4 shows the results of a smoking predictors study in which we recruited non-smokers from the control group at wave 1 and compared smoking initiators with those who did not pick up smoking after six months (wave 2). We used T-tests to assess the mean differences between smokers and non-smokers and logistic regression analyses to determine the predictors of smoking onset among Saudi adolescents.

Chapter 5 outlines the evaluation of the intervention programme developed on the basis of qualitative and quantitative information, six months after implementation. We found that smoking initiation was at 3.2% in the experimental group and 8.8% in the control group ($p < 0.01$), with a significantly more negative attitude towards smoking, stronger social norms against smoking, higher self-efficacy regarding non-smoking, more action planning to remain non-smokers, and lower intentions to smoke in the future among the experimental group.
Chapter 1

Chapter 1 discusses the main findings of the various studies on smoking prevention for Saudi adolescents, summarizes the methodological strengths and limitations of the entire thesis, and addresses implications for future research on smoking prevention programmes.

This chapter also discusses what could be improved, which other approaches could be used, and recommendations for tobacco control programmes in SA.
References


Chapter 1


Digital health: Mobile and wearable devices for participatory health applications
General introduction


Chapter 1


Belief, attitude, intention and behaviour: An introduction to theory and research.


Chapter 1


Chapter 1


General introduction


Retrieved June 10, 2018, from https://www.who.int/tobacco/economics/background/en

Towards a better understanding of factors affecting smoking uptake among Saudi male adolescents: A qualitative study

This chapter is published as:

https://doi.org/10.18332/tpc/120000
Abstract

Introduction. An increased smoking uptake by Saudi male adolescents and a lack of data about its determinants emphasize the need for a better understanding of factors leading to the onset of smoking and identifying ways to prevent it. The aim of this qualitative study is to explore adolescents’ views on smoking and their opinions about a smoking prevention programme. The aim of this qualitative study is to explore adolescents’ views on smoking and their opinions about a smoking prevention programme.

Method. A total of 103 school-going adolescents, aged 12–16 years, were purposely selected from grades seven, eight and nine from nine schools in Taif in Saudi Arabia. They were interviewed in non-smoker spaces. An interview scheme was developed based on the I-Change Model, a model used for understanding smoking onset and prevention. We used QDA Lite version 2:0 software for data analysis.

Results. Most of the participants agreed on the importance of social influences as determining factors to start smoking. The presence of smoking friends and family member(s), especially the father, were mentioned. Factors such as having extra pocket money, absence of alternatives, showing off, to be seen as western, to be seen as an adult and the good taste of cigarettes were also mentioned as belief associated with smoking. Adolescents indicated to have low confidence not to smoke under peer pressure, suggesting self-efficacy problems. Intentions to smoke were also often mentioned. Almost all participants agreed that an interactive approach is optimal for an effective smoking prevention programme.

Conclusions. Determinants of smoking seem to be very similar to those outlined by previous studies. A smoking prevention programme for Saudi adolescents should address how to cope with social pressure to smoke, the advantages connected with smoking, and how to increase self-efficacy. Information should be presented in an interactive rather than static way.
Towards a better understanding of factors affecting smoking uptake: A qualitative study

Introduction

Tobacco use remains one of the main causes of preventable diseases including various types of cancers and coronary heart diseases (USDHHS 2010). Adolescents’ smoking remains one of the major public health concerns, since it is clearly found that onset of smoking in adolescence increases the chance of becoming a regular smoker in the future and to reduce chances of quitting later (Mermelstein, 2008).

Since the work of Evans et al. (Evans, 1979) in the late 70’s, it is clear that social factors are strongly related to smoking onset in adolescents, particularly pressures exerted by others, mostly peers, parents and the mass media. School-based smoking prevention programmes using a social influence approach in which youngsters learn how to cope with these pressures were found to be significantly effective although programme effects decay after a couple of years (de Vries, Mudde, Kremers, et al., 2003; Peterson, Kealey, Mann, & Mar, 2007). Studies suggested that programme effectiveness could be enhanced when using interactive delivery methods and involving adolescents as group leaders (Campbell et al., 2008; Flay, 2009; Mermelstein, 2008).

Adaptation of the social influence approach to other countries requires that one verifies whether similar determinants operate as those found in industrialized parts of the world, such as the US and Europe. Research in non-western countries revealed that similar constructs as those found in western countries are relevant: attitudes, social influences and self-efficacy (Reddy, Ruitert, Bergstrom, & de Vries, 2007), but that the content of these factors may be determined by specific variables within such a culture. Hence, it is vital to identify the most important determinants of smoking behaviour before developing a programme.

Investigating determinants of behaviour and identifying preferences of the target group of educational strategies to be used, is an important step in programme development, where using qualitative methods can yield rich and in-depth information (Bryman, 2017; de Vries, Weijts, & Fantus, 2017). Adolescents about certain behaviour for instance: smoking (Sheer, Mao, & Chen, 2017), nutritional habits (Krölner et al., 2011) and sexual behaviour (Jennings et al., 2017; Fantus, Woodford, &
studies, the reported prevalence was somewhat higher than among other age groups, whereas prevalence among boys was higher than among girls (12.4%-39.6% versus 3.8%-11.1% respectively) (Alasqah, Mahmud, East, & Usher, 2019). Yet, most of these studies mainly reported smoking prevalence and did not target its determinants, such as attitudes, social factors and self-efficacy; Alsamghan et al., 2017; Alsubai, Park, Alagili, & Bartolucci, 2012) reveal that friends, parents and important others, have the most important effects on youngsters.

The first goal of this study is to explore the determinants of adolescents' smoking behaviour and to explore potential differences between smokers and non-smokers. A second goal is to explore adolescents' preferences for intervention development and implementation of smoking prevention programmes. Perceptions of both adolescents living in rural and urban areas were assessed to identify potential differences as well.

Method

This is a qualitative study among 103 school-going adolescents, from nine schools in Saudi Arabia, who were interviewed in 11 focus groups. Ethical clearance in the region of the study was only granted for interviews with male adolescents, as authorities indicated that smoking was not allowed among females. Smokers and non-smokers were separately interviewed: smokers in five groups, and non-smokers in six groups. Two researchers supervised each of the 11 focus groups: one led the discussion and took notes, while the other was in charge of audio-visual recording. All the discussion groups were held during school days in the school library and out-of-class time. The group discussions were held in absence of teachers and parents in order to let the participants talk and express themselves freely. All the group discussions were recorded. Each group was attended by 9–11 participants, the discussion for each group took 45–55 minutes (the normal class in Saudi Arabia is 45 minutes), smokers’ groups were more active than those of the non-smokers, rural boys were less active than the urban boys, yet almost all participated in the discussion.

Participants
Towards a better understanding of factors affecting smoking uptake: A qualitative study

... who agreed to participate were 103 (85.8%), from nine randomly selected schools; six were urban schools and three were rural schools from Taif province in Saudi Arabia. Fifty adolescents were smokers and fifty-three were non-smokers (Table 1). Ethical approval for the study was obtained from the provincial school management structure, which involved the Director General of education in Taif province, the director of the school health programme as well as the principals of the nine participating schools. A written justification of the study was provided to the parents of all 103 students and their written consents obtained. Verbal consents of participants were obtained after explaining to them the study goals and giving the chance not to participate or to stop whenever they wished.

**Procedure and topic guide**

For data collection, we developed and used a discussion guide based on The I-Change Model (de Vries, 2017) a model that integrates concepts from various social cognitive theories, and which was used to study smoking behaviour in Europe (de Vries, Mudde, Leijts, et al., 2003) and the Middle East (Farajat, 2010). The discussion guide addressed the following factors: advantages and disadvantages of smoking attitude, social influences in favour or against smoking, situations that make it difficult not to smoke (self-efficacy) and what to do about this (action plans), and intention to smoke (Table 2). Participants were also given the chance to raise additional topics during the interviews and address any factors related to their smoking behaviour other than those included in the content (what should be discussed and how, e.g. using scary messages or scientific information), timing (during school time or out-of-school time), place: inside the school (classrooms, library or other), and method of delivery (electronic, printed materials, role play, or others). Additionally, we assessed age, smoking status (defined as having smoked at least one cigarette in the last day/week/month). Smokers and non-smokers addressed the same factors, and questions were adapted to best match their smoking status.

**Data analysis**

The video-recorded interview data and the written notes were reviewed by the research team. Based on the group discussion, questions and answers, a coding scheme was developed by the principal researcher and research assistant. The transcripts were coded using QDA Miner (v2.0), a...
Chapter 2

We performed the coding following the thematic coding approach provided by the software, we organized the texts into three levels: 1) demographic factors, age, grade, and area (urban, rural); 2) smoking status (smokers and non-smokers); 3) smoking determinants (attitude, self-efficacy, social influence, and intention). During the coding procedure, additional sub-codes were added to the coding scheme for the items that did not belong to any of the above three levels. To check the validity of the coding process, two transcriptions were fully coded by the principal researcher and one of the research assistants and a third person checked the coding results. The most frequently mentioned items per factor were grouped under headings if they represented similar types of answers.

Results

Participants

The sample included 103 male adolescents aged 12–16 years with a mean age of 13.8 years, with 29 (28.2%) in grade seven, 43 (41.7%) in grade eight, and 31 (30.1%) in grade nine. Non-smokers were 53 (51.5%) and smokers were 50 (48.5%). Of the total sample, 37 (35.9%) were from rural areas and 66 (64.1%) from urban areas (Table 1).

Table 1: Demographic characteristics of the participating school-going adolescents, Saudi Arabia.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Values</th>
<th>Non-Smoker (n=53)</th>
<th>Smokers (n=50)</th>
<th>Total (n=103)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>Area</td>
<td>Urban</td>
<td>33</td>
<td>33</td>
<td>66</td>
</tr>
<tr>
<td>Grade</td>
<td>Seven</td>
<td>13</td>
<td>16</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Eight</td>
<td>24</td>
<td>19</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>Nine</td>
<td>16</td>
<td>15</td>
<td>31</td>
</tr>
</tbody>
</table>

...
Table 2: Questions asked and items discussed with school-going adolescents, Saudi Arabia.

<table>
<thead>
<tr>
<th>Smokers (N= 50)</th>
<th>Non-Smokers (N=53)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why did you start smoking?</td>
<td>Why didn’t you start smoking?</td>
</tr>
<tr>
<td>Do you think you will ever start smoking and if yes, why?</td>
<td>Have you ever stopped smoking and then relapsed to smoking? If yes, why did you start smoking again?</td>
</tr>
<tr>
<td>Have you ever tried to smoke? If yes, why?</td>
<td>What reasons have you not started smoking?</td>
</tr>
<tr>
<td>Attitude</td>
<td></td>
</tr>
<tr>
<td>What were the reasons for you to start smoking?</td>
<td>What are the reasons that you haven’t started smoking?</td>
</tr>
<tr>
<td>What are the advantages for you to start smoking?</td>
<td></td>
</tr>
<tr>
<td>What would be reasons for you to be a smoker?</td>
<td></td>
</tr>
<tr>
<td>Social influences</td>
<td></td>
</tr>
<tr>
<td>How many of your friends are smokers?</td>
<td>How many are not?</td>
</tr>
<tr>
<td>How many of your friends are smokers?</td>
<td>How many are not?</td>
</tr>
<tr>
<td>Do your parents know that you smoke? Do any or both of them smoke?</td>
<td>Do you intend to quit in the future? Do you intend to smoke in the future?</td>
</tr>
<tr>
<td>If a non-smoker wants to continue being a non-smoker, what should he do? If a smoker wants to quit, what should he do?</td>
<td></td>
</tr>
<tr>
<td>Characteristics of the intervention programme</td>
<td></td>
</tr>
<tr>
<td>If there is a programme that can help adolescents not to smoke, will you participate? Why? If not, why not?</td>
<td></td>
</tr>
<tr>
<td>What is the best channel to deliver the programme materials to students and why?</td>
<td></td>
</tr>
</tbody>
</table>
Perceived smoking determinants

Attitude

“Look my friend; when I smoke, then I am a real man, an adult not a kid anymore, even others see me as a man, a civilized man” (Rural smoker, grade seven, 13 years)

“Being a smoker, having a cigarette, cigar or even smoking pipe, will not make you a civilized or western” (Urban non-smoker, grade nine, 15 years)
Towards a better understanding of factors affecting smoking uptake: A qualitative study

“The right question is why didn’t non-smokers start to smoke, it is tasty and you will never know that unless you taste it” (Urban smoker, grade eight, 14 years)

All non-smokers from the two areas think that people of their age smoke because they underestimate the harmful effects of cigarettes on health. “They don’t look to the consequences of smoking; they think it doesn’t affect them, but smoking does” (Rural non-smoker, grade seven, 13 years)

“Most probably they don’t know that it only kills them, if not; they will be sick, and what a nasty smell it gives to the breath” (Rural non-smoker, grade eleven, 14 years)

Smokers from the two areas were not convinced that smoking is harmful to their health. “I don’t think it has effects on my health. My 65-year-old grandfather has been smoking for the last 40 years: he is still healthy. It has nothing to do with health” (Rural smoker, grade eight, 14 years)

“In the media, doctors always warn us about the hazards of smoking; look to my grandfather, who is now over 75 years old and being smoker for more than 50 years and he is quite well. I don't think smoking is bad for my health”. (Urban smoker, grade nine, 15 years)

Most of non-smokers stated that being a smoker implies being non-religious and that for them this was one of the reasons not to smoke: “The devil always likes making people do the bad and wrong things, if you are not religious enough you are going to follow and smoke” (13 years, grade eight, rural, non-smoker). Social influences

Smokers and non-smokers differed concerning the norms that they encountered with smoking, the amount of smoking (male) adults, and in particular smoking pressures from friends, the father, older brothers and older cousins and uncles. All smokers from rural and urban areas, but less non-smoking adolescents, mentioned to have at least one family member or a friend who smokes. One participant stated, pointing to one of the participants in the group and laughing:

“The devil always likes making people do the bad and wrong things, if you are not religious enough you are going to follow and smoke” (Urban smoker, grade eight, 14 years)

Social influences
“He is the boy who introduced me to smoking. He offered me a cigarette, which I could not refuse. The next day I bought the third cigarette myself. And here I am, friends being alike” (Urban smoker, grade seven, 12 years)

Almost all non-smokers agreed on the influence of the father, older brothers and cousins on adolescent smoking behavior, as they serve as role models for what is normal concerning smoking.

“Like father like son, when your father smokes, this means the right thing to do” (Urban smoker, grade nine, 14 years old)

“If your father and your elder brother(s) smoke, why wouldn’t you?” (Rural non-smoker, grade seven, 12 years)

Self-efficacy

Smokers and non-smokers differed concerning situations where they encountered it to be difficult not to smoke. Smokers appeared to often have friends that also smoke. Consequently, smokers mentioned that it would be very difficult not to smoke in these social situations when a friend would offer a cigarette or when being with a group of smoking friends:

“Even if you don’t want to smoke in a moment, it is not easy to refuse an offered cigarette from your buddy, it is nice to share smoking with a friend.” (Urban smoker, grade nine, 15 years)

Non-smokers found it difficult not to smoke especially when they are called childish by others if they refuse an offered cigarette.

“I can’t accept to be called “the chicken” or “still a child not a man”, if didn’t smoke an offered cigarette, so I have to take it.” (Urban non-smoker grade nine, 14 years)

Being at risk to smoke was also mentioned by most non-smokers when having more pocket money, as they mentioned, smoking would then become very easy to do. Additionally, smokers mentioned that feeling bored also increased the risks to smoke, in particular in the absence of alternatives like entertainment places. In Saudi Arabia bachelors were not allowed to visit shopping malls, thus reducing possibilities for finding entertainment.
Towards a better understanding of factors affecting smoking uptake: A qualitative study

“Look at our area, there are buildings everywhere, no place for sport activities. Sport clubs are expensive and malls are only for families. The easiest thing to do is to smoke, it doesn’t cost much.” (Urban smoker, grade nine, 14 years)

Intentions

Both groups mentioned that intention and will power are important to practice or not to practice smoking. Few smokers had the intention to quit smoking, but several non-smokers were intending not to start smoking:

“It’s also the will and intention, if you want to smoke you will. If you won’t” (Rural non-smoker, grade nine, 13 years old)

Action plans

Most smokers and non-smokers did not mention a wide array of action plans to prepare them not to smoke or how to deal with challenging situations that may prompt them to smoke. Almost all non-smoking participants mentioned that having non-smoking friends would help them to continue being a non-smoker:

“Having good friends, doing the right things, helped me a lot not to start… I prefer to be with them my whole life” (Rural non-smoker, grade eight, 13 years)

Both non-smokers and smokers mentioned the need for having good strategies to be able to refuse cigarettes:

“Although it is hard to refuse an offered cigarette, if only we learnt how to say “No” in such situation we wouldn’t be smokers” (Rural smoker, grade nine, 15 years).

The main reasons considered for smoking were: having a family member or a friend who smokes, lack of alternative pastime, availability and affordability of cigarettes, denial of smoking effects on health, and smoking being tasty. Non-smokers agreed with smokers in having pocket money being a reason to smoke. Additionally, non-smokers see that being unreligious is one of the reasons to smoke and some of them see that being smoker is a way to be unreligious. All participants see that being busy with useful activities is protective from starting smoking. The two groups agreed
Table 3: Summary of the most frequently mentioned factors to smoke for school-going adolescents, Saudi Arabia.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Smokers</th>
<th>Non-smokers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atitude</td>
<td>Smokers looks good as smoker looks like adult</td>
<td>Smokers looks westernized</td>
</tr>
<tr>
<td>Social influence</td>
<td>Having smoking friends</td>
<td>Having smoking friends</td>
</tr>
<tr>
<td>Pressure</td>
<td>Pressure from friends to smoke</td>
<td>Pressure from friends to smoke</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Difficult not to smoke when offered a cigarette called “chicken” or “childish”</td>
<td>Called “chicken” or “childish” when refusing an offered cigarette</td>
</tr>
<tr>
<td>Additional factors</td>
<td>Absence of alternatives</td>
<td>Absence of alternatives</td>
</tr>
<tr>
<td></td>
<td>Having abundant pocket money</td>
<td></td>
</tr>
</tbody>
</table>

Intervention programme preferences

Contents of the intervention programme

“If I had known how to say no to the first cigarettes offered to me, I would not...”
Towards a better understanding of factors affecting smoking uptake: A qualitative study

...early enough how to say no. That is the entire story.” (Urban smoker, grade eight, 13 years).

Additionally, smokers and non-smokers indicated the need for stressing the importance of health, the detrimental effects of smoking to their health at short-term, and provide alternatives to feeling bored.

“I think the programme should concentrate on physical fitness. Everybody now wants to be a good player in football, basketball or whatever. If they knew that smoking would make their hopes go with the wind, they wouldn’t smoke” (Urban non-smoker, grade nine, 15 years).

Besides giving information about the impact of smoking on health, respondents also indicated that the programme should include getting the target population to visit hospitalised smokers due to the adverse effects of smoking.

“This is the better way [visiting hospitalised smokers] . People are usually afraid of diseases and death. With this, the smokers will perceive their dark future and then quit and non-smokers will not start smoking” (Urban non-smoker, grade eight, 14 years).

Channel of intervention programme delivery

We asked the adolescents who should be teaching the programme, such as teachers and religious leaders. Only few of the participants agreed that a teacher would be an appropriate intervention provider as most of them are smokers, so they aren’t the right persons to tell others not to start smoking” Urban non-smoker, grade nine, 15 years).

Almost none of the participants regarded a religious man as suitable; mostly due to their perception that Imams preach and adolescents usually do not like to listen to a sermon. Almost all participants preferred to have a programme that combines a delivery by the school health staff with active participants’ involvement.
“The school health staff are suitable for this job, they know what they are doing, and they consider what we want. Then such a programme is a good example for their work.” (Rural non-smoker grade eight, 13 years)

Format of the intervention programme

Additionally, we explored how the programme should look concerning the format, and the timing of programme delivery. None of the participants believed providing a programme with only printed materials like brochures and pamphlets would be attractive and effective. Almost all of them rejected the idea of lectures:

“Lectures are boring. We have had enough lectures during the school classes, we just sit to listen because we have to, we aren’t really listening; it is as if we weren’t there. Some of us even fall asleep during the lectures” (Rural non-smoker, grade seven, 12 years).

Almost all of the participants suggested to us to use role plays and movies as forms of intervention delivery:

“Why not do something that gives us the sense of responsibility and ownership? Something that tells us: that we are a part of it, like a movie we make or a role play and we are the players or group work and leaders. For how long are we going to be listeners?” (Urban smoker, grade nine, 14 years).

Timing of the intervention programme

All participants agreed upon the timing to be during the school day:

“Nobody will come to attend a programme in his free time. It is time for fun and not for activities that make you remember the lessons. If the programme is going to be a matter of fun and during school time, then it is ok” (Urban smoker, grade nine, 15 years).

In summary, Saudi adolescents prefer to have an interactive smoking prevention programme, with refusal skills provided via role play, drama, and group discussion, delivered during school time by health care workers and group works led by peers (Table 4).
Table 4: Summary of the intervention programme components suggested by 103 school-going adolescents, Saudi Arabia.

<table>
<thead>
<tr>
<th>Components</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting</td>
<td>School-based programme inside school</td>
</tr>
<tr>
<td>Timing</td>
<td>During school day as part of regular classes</td>
</tr>
<tr>
<td>Formats</td>
<td>Interactive group work and discussion, role play and drama</td>
</tr>
<tr>
<td>Key elements</td>
<td>Training on: - Group work and group leading. - Strengthening of self-efficacy and refusal skills. - Coping with pressure to smoke</td>
</tr>
</tbody>
</table>
| Discussion | The study is explored male adolescents’ perceptions on smoking behaviour and its determinants, as well as their views on the content and format of a smoking prevention programme. From the data, it is clear that one of the driving factors for adolescents to start smoking concerns a positive attitude and positive outcomes associated with smoking. In particular, positive outcomes such as smoking is tasty, helps you to show off and to be seen as an adult, were clearly mentioned by smoking participants, which is consistent with other studies (Bigwanto, Mongkolcharti, Pelzter, & Laosae, 2017). To be seen as Western was also regarded as important, both among smokers, but also among rural non-smokers. It is conceivable that this belief can also be the result of influences of television, movies, and other media (Fulmer et al., 2015). Furthermore, some beliefs served to prevent smoking, such as being convinced of the detrimental health effects, and the fact that smoking is not in line with religious beliefs. This finding is in line with other studies in Saudi Arabia that found religion to be an important reason for not smoking among non-smokers (Al Agili & Al-Rusood, 2011). Social influences such as modelling, norms and social pressure were mentioned to be main causes for adolescents to start smoking. In particular, the father, elderly brothers and cousins, and smoking friends were clearly mentioned. The influence of friends is also reported in other international.
important role and where it is important to behave similar as older males (Alasqah et al., 2019; de Vries, 2017; Elfeddali, Bolman, Candel, Wiers, & de Vries, 2012; Kok, Den Boer, de Vries, Gerards, & Mudde, 2014), we also found that low self-efﬁcacy to refrain from smoking was an important risk factor for adolescents to start smoking. Smoking Saudi boys mentioned that they lacked skills to refuse offers for a cigarette, and mentioned, as did nonsmokers, that this should be addressed in a smoking prevention programme. Additionally, nonsmokers often mentioned that they were called cowards and not grown-up or not western, highlighting a need for nonsmoking youths to be made able and conﬁdent to address these issues. These were also mentioned when discussing which action plans were needed. In line with having non-smoking friends, how to cope with boredom also needed to be addressed in a smoking prevention programme. As part of community regulations in Saudi Arabia, bachelors are not allowed to visit shopping malls, thus reducing possibilities for entertainment. Furthermore, the available gym and sport centres are not affordable by them.

For the development and implementation of an anti-smoking intervention programme, participants suggested to include a hospital visit to see those who were badly affected by smoking. Yet, although mentioned, this suggestion is contrary to what is found in the literature about fear appeal, showing that coping appraisals are more powerful predictors of precautionary actions than threat perceptions (Ruiters, Abraham, 2001). Consequently, the traditional method followed in Saudi Arabia for teaching (i.e. delivering lectures to the class), adolescents dismissed as similar as this was regarded as boring and unattractive. Alternatively, they suggested a new approach in which they should be part of the programme delivery and not only listeners. They argued for health
Towards a better understanding of factors affecting smoking uptake: A qualitative study

...workers as programme providers, and peer-led group discussions. These suggestions are consistent with peer-led approaches described by others and in line with conditions for effective school-based intervention programmes with long-term expected effects (Flay, 2009; Sussman, ...)

Blacks & Rohrbach, 2010). Adolescents against stress the need to be trained on how to cope with pressure in line with recent reviews that revealed that peer-led programmes are effective when combined with social competence/social influences curricula (Thomas, McLennan, & Perera, 2015). The best timing chosen by participants for the programme activities would be during school days within the school setting, since the school setting offers a homogenous environment with availability of students in school time (Wallace, Finch, Giles, & Newbury-Birch, 2017).

Strength and limitation

This is the first qualitative study that explores the determinant of smoking behaviour among male adolescents, hence the selected participants were enthusiastic to participate. Using the I-Change Model as a theoretical framework enhanced the exploration of the smoking determinant. The structured interview guide with the open-ended questions helped the participants to express their opinions without limitations. The interviews in absence of teachers and parents helped students to talk freely.

In our study only school-going male adolescents were interviewed, and we were not able to include female adolescents. Hence, the findings of our study are limited to the group interviewed and cannot be generalized. Given the fact that smoking uptake is becoming more popular in recent years among groups that were not represented by the sample, more research to investigate these groups is needed.

Conclusion

The study reveals established important factors related to smoking onset, but also the importance of specific cultural beliefs within these factors to be addressed, such as the importance of looking western as a driver for smoking and adhering to the Islam as a preventive factor. For male boys the smoking male context provides enormous social challenges in order not to start smoking, indicating the importance to focus on these items when increasing self-efficacy not to smoke and to develop specific action plans for these situations. This also suggests a clear need not only to target male adolescents but also male adults in order to change social norms about smoking. Lastly, the...
Chapter 2

Respondents in our study preferred an interactive school prevention programme in which they could play an important role with the guidance of peer leaders.

Authors’ contribution

MM planned and managed the focus group discussions, gathered data, analysed and interpreted results, and produced the first draft of the manuscript with support from NDV, KLC and HDV. Different versions of the manuscript have been reviewed and conceptualised by all co-authors. All authors have read and approved the final manuscript.

Conflict of interest

None declared.

Acknowledgements

We would like to thank the participating schools, the schools’ principals and the participating students. Special thanks for Mr. Fahad Alotaibi who was in charge of audio-visual recording and Mr. Ahmed Alzahrany who arranged the schools visits.
Towards a better understanding of factors affecting smoking uptake: A qualitative study

References


Towards a better understanding of factors affecting smoking uptake: A qualitative study


Chapter 2


Smoking uptake among Saudi adolescents, tobacco epidemic indicators and preventive actions needed

This chapter is published as:

https://doi.org/10.1177/1757975914548193
Abstract

The aim of this cross-sectional school-based study was to assess smoking prevalence, indicators for the smoking epidemic and determinants of smoking among Saudi adolescents. The study included 695 male adolescents from 11 to 16 years of age who filled out self-report questionnaires based on the European Smoking Framework Approach questionnaire, which uses the I-Change model to assess attitude, social influence and the self-efficacy of the participant. Smokers were 275 (39.6%) adolescents. Smokers tended to receive more daily pocket money, live in families that are more affluent and show lower academic performance. Non-smokers were inclined to believe that smoking might help people feel relaxed and confident, encountered less social influence to smoke than smokers, but reported low self-efficacy not to smoke when with smoker friends and when offered a cigarette. Smokers reported the low self-efficacy not to smoke in all situations assessed.

The results suggest the smoking epidemic among male Saudi adolescents may still be in the early stages, providing ample opportunity for preventive actions aimed at halting the further progress of this epidemic. Secondly, smoking prevention programmes in Saudi Arabia need to reinforce non-smoking attitudes, address how to resist pressure to smoke, and how to develop high self-efficacy towards non-smoking in various situations.

Keywords: Smoking epidemic, Motivational Determinants, I-change model, Adolescents, Saudi Arabia
Smoking uptake, tobacco epidemic indicators and preventive actions needed

Introduction

Tobacco use is causing many preventable diseases, including various types of cancer and coronary heart diseases (CDC, 2008). Smoking is responsible for five million deaths each year. Based on current smoking trends, tobacco is expected to result in about eight million deaths annually by 2030 (WHO, 2009).

Smoking prevalence among adolescents in Arab countries is increasing with variation from one country to another: Saudi Arabia ranges from 12% to 29.8% (Bassioni, 2009), Lebanon 53%, Yemen 43%, Kuwait 18%, and 7% in Oman (Mohammed, Newman, & Tayeh, 2006). According to Lopez and colleagues (Lopez, Collins, & Piha, 1994) smoking uptake rates follow a chronological pattern which can be divided into four stages. In stage 1, smoking is initially highest among people in higher socioeconomic positions. Stage 2 shows the behaviour diffuses throughout the population and the socioeconomic gradient diminishes, due to increased prevalence among less affluent socioeconomic groups. In stage 3, the prevalence declines among higher socioeconomic groups but remains high among those with lower socioeconomic status.

Public health interventions aiming at reducing smoking prevalence need to address the changeable smoking determinants through health communication interventions (de Vries & Kok, 1998; Panday, Reddy, Rutten, Bertsom, & de Vries, 2007). Creating positive attitudes towards non-smoking, resistance against pressure, increasing self-efficacy and enhancing refusal skills, are key elements for successful prevention programmes (Evans et al., 1978; Flay, 1985; Flay, Hu, & Richardson, 1998). Whereas these developments took place in industrialized countries in the 80's and 90's, interest for this topic is increasing in African and Arab countries (de Vries et al., 2003; de Vries et al., 2006; Farajat, 2010; Holm, Kremers, & de Vries, 2003; Hoving, Reubsaet, & de Vries, 2007; Dijk, Mesters, 2010; Panday et al., 2007).

In order to assess the sociocognitive factors related to smoking among Saudi male adolescents, the I-Change Model (de Vries et al., 2003) was used. It integrates insights from several cognitive states that intention is the most important determinant of behaviour and is determined by attitudes, social influences, and self-efficacy. Furthermore, the model acknowledges a pre motivational and post-motivational phase, and specifies distal factors such as demographic and psychological factors.
Chapter 3

that are assumed to influence behaviour via proximal factors. The I-Change model has been previously used to study smoking behaviour and to develop and evaluate smoking prevention programmes in several European and African countries (de Vries et al., 2014; Dlamini et al., 2009; Taylor et al., 2007). It has been recently applied to assess the relevance of socio-cognitive factors in Jordan (Farajat, 2010). This study is the first to address the applicability of socio-cognitive models for understanding smoking behaviour in Saudi Arabia.

The first goal of this study is to determine demographic differences between adolescent smokers and non-smokers and to obtain indicators related to the stage of the tobacco epidemic in Saudi Arabia. The second goal is to assess differences between smokers and non-smokers concerning attitude, perceived social influences, self-efficacy, and intention towards smoking. The third goal is to describe whether the I-Change Model can be applied in order to understand smoking behaviour of Saudi adolescents.

Method

Participants

This study started early 2008 in Saudi Arabia, where school structure entails gender specific education and smoking is not regarded as a priority in the female education programme. Consequently, this study did not obtain ethical approval to include female adolescents. Hence, the total sample size was 714 randomly selected male students aged 11-16 years.

Sampling

From 75 urban schools and 43 rural secondary schools (grades seven, eight, and nine), seven schools and four schools respectively were randomly selected. The number of schools selected from each area was proportional to the number of schools in that area, and the number of students was proportional to the number of students in each grade (Panday, Reddy, Ruiters, Bergstrom, & de Vries, 2007).

Procedure

A permit request letter enclosing the research proposal and the questionnaire was issued to the General Director of Education. On gaining approval, letters were issued to the selected schools’
Smoking uptake, tobacco epidemic indicators and preventive actions needed

During data collection day, all participants who provided their own and their parents’ written consent were asked to provide their own and their parents’ written consent.

During data collection day, all participants who provided their own and their parents’ written consent were asked to provide their own and their parents’ written consent.

**The questionnaire**

*The questionnaire* translated into Arabic with some adaptations made to fit with the Saudi norms. Consequently, the questions assessing behaviour, social norms, modelling and pressure from the girlfriend or boyfriend were omitted.

The questionnaire assessed demographic characteristics, smoking behaviour, motivational factors and intentions to smoke in the future.

**Demographic factors** included age, grade (1 = seven; 2 = eight; 3 = nine), area (1 = rural; 2 = urban), family monthly income (1 = less than US$800; 2 = more than US$800 and less than US$1500; 3 = more than US$1500 and less than US$3000; 4 = US$3000 or more), pocket money (1 = less than US$5 and 2 = US$5 or more), and academic achievement (based upon school records): 1 = in the upper third; 2 = in the middle; 3 = in the lower third.

**Motivational factors** included attitude, self-efficacy and social influences. Attitude was measured using nine items (Cronbach’s α = 0.89). Self-efficacy was measured by items on a seven points scale (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98). Intention was measured using two items on a seven points scale (+3 to −3) asking the respondent if he is able not to smoke in various situations (α = 0.98).
Smoking behaviour was categorized based on an algorithm used by earlier international studies (Ariza et al., 2008; Ausems, Mesters, van Breukelen, & de Vries, 2002; de Vries et al., 2006; Lotrean, Mesters, Müller, & de Vries, 2013). Two groups were formed, smokers and non-smokers. Participants were asked to pick a statement that best described them out of a set of specific smoking-related statements: A. Participants were coded as ‘non-smokers’ when they selected one of the following: 1. I have never smoked, not even one puff; 2. I have tried smoking once in a while, but I don’t smoke anymore; 3. I have quit smoking, I have always smoked less than once a week; 4. I have quit smoking after having smoked at least once a week; 5. I tried smoking once in a while; 6. I smoke less than once a month; 7. I don’t smoke weekly but at least once in a while; 8. I smoke once in a while; 9. I smoke less than once a day; 10. I smoke more than 100 cigarettes or more in their life unless they reported that they have quit smoking (de Vries et al., 2006; Lotrean et al., 2013) consisting of four additional concepts; smoked in the past 24 hours; last seven days; last month, and lifetime smoking. Self-reported smoking was cross-validated using an algorithm and lifetime smoking. Inconsistencies in answers were resolved by coding the most unfavourable response (de Vries et al., 2007).

Statistical analysis

Using SPSS 17, differences between smokers and non-smokers were analysed using Chi-square and Mann-Whitney U tests. Logistic regression was used to assess predictors of smoking. A three-step method was used: Model 1 included the effects of demographic variables on smoking; Model 2 added attitudes, social influences, and self-efficacy to model 1; Model 3 added intention to smoke to model 2.

Results

Due to missing data on key variables, eight cases were excluded from the analysis. Another 11 were excluded because they did not have parental consent, resulting in a final sample size of 695 (97.3%), of which 39.6% indicated being smokers.

The mean age of the participants was 13.4 years (SD = 1.02). Distribution over grades seven to nine was 34.7%; 30.9% and 34.4% respectively. Lower school achievement was reported by 38.4% of the participants.
Smoking uptake, tobacco epidemic indicators and preventive actions needed

Regarding family monthly income, 17.4% reported less than US $800; 18.4% reported more than US $800 but less than US $1500; and 16.5% reported more than US $1500 but less than US $3000. 47.6% reported US $3000 and above. Regarding daily pocket money, 52.4% reported less than US $5 a day, and 47.6% receive US $5 and above per day. Most respondents had an urban background (76.1%). No significant differences were found regarding smoking prevalence between urban and rural students.

Table 1: Demographic differences between smokers and non-smokers.

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Non-smoker (N= 420)</th>
<th>Smoker (N=275)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>11-12</td>
<td>64.8% (103)</td>
<td>35.2% (56)</td>
</tr>
<tr>
<td></td>
<td>13-14</td>
<td>60.1% (255)</td>
<td>39.9% (169)</td>
</tr>
<tr>
<td></td>
<td>15-16</td>
<td>55.4% (62)</td>
<td>44.6% (50)</td>
</tr>
<tr>
<td>Family monthly income USD</td>
<td>&gt;800</td>
<td>66.1% (80)</td>
<td>33.9% (41)</td>
</tr>
<tr>
<td></td>
<td>800 and &gt;1500</td>
<td>71.9% (92)</td>
<td>28.1% (36)</td>
</tr>
<tr>
<td></td>
<td>1500 and &gt;3000</td>
<td>51.3% (59)</td>
<td>48.7% (56)</td>
</tr>
<tr>
<td></td>
<td>3000 or more</td>
<td>57.1% (189)</td>
<td>42.9% (142)</td>
</tr>
<tr>
<td>Daily Pocket Money USD</td>
<td>&lt; 5</td>
<td>72.0% (262)</td>
<td>28.0% (102)</td>
</tr>
<tr>
<td></td>
<td>5 or more</td>
<td>47.7% (158)</td>
<td>52.3% (173)</td>
</tr>
<tr>
<td>Area</td>
<td>Urban</td>
<td>59.5% (315)</td>
<td>40.5% (214)</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>63.3% (105)</td>
<td>36.7% (61)</td>
</tr>
<tr>
<td>Grade</td>
<td>Grade 7</td>
<td>63.1% (152)</td>
<td>36.9% (89)</td>
</tr>
<tr>
<td></td>
<td>Grade 8</td>
<td>63.7% (137)</td>
<td>36.3% (78)</td>
</tr>
<tr>
<td></td>
<td>Grade 9</td>
<td>54.8% (131)</td>
<td>45.2% (108)</td>
</tr>
<tr>
<td>Academic performance</td>
<td>Best</td>
<td>65.0% (180)</td>
<td>35.0% (97)</td>
</tr>
<tr>
<td></td>
<td>Third middle</td>
<td>59.9% (160)</td>
<td>40.1% (107)</td>
</tr>
<tr>
<td></td>
<td>Lower third</td>
<td>53% (80)</td>
<td>47.0% (71)</td>
</tr>
</tbody>
</table>

Total 60.4% (420) 39.6% (275)
Table 2: Attitudinal, self-efficacy and intention differences between smokers and non-smokers.

<table>
<thead>
<tr>
<th></th>
<th>Non-smoker (N=420)</th>
<th>Smoker (N=275)</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude</strong> ^a^Smoking;^b^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Attitude</strong> ^a^Smoking;^b^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy ^c^: I am able not to smoke when I am</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention to Smoke ^c^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Attitude (-3, +3), b Self-efficacy: +3: high self-efficacy to refrain from smoking. c Intention: +3 = I am sure I will smoke, -3 = I am sure I won’t smoke*
Attitudinal, self-efficacy and intentional differences between smokers and non-smokers

As noted in Table 2, smokers had significantly more positive attitudes towards smoking and were more convinced that smoking is desirable, pleasant, helps to relax and makes one feel confident. Non-smokers were less convinced of these pros.

Non-smokers reported significantly higher self-efficacy for all situations assessed. However, non-smokers were least efficacious to refrain from smoking when with friends who smoke and when offered a cigarette. Smokers reported low self-efficacy to refrain from smoking for all the situations assessed.

Social influences differences between smokers and non-smokers

Table 3 reveals that smokers reported experiencing significantly more pressure and positive social norms towards smoking from friends, best friends and classmates. Non-smokers experienced less pressure from all social reference groups.

<table>
<thead>
<tr>
<th>Items</th>
<th>Non-smoker (N=420)</th>
<th>Smoker (N=275)</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brother (s)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sister (s)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Best friend</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friends</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classmates</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher (s)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall social norms</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social modeling b</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predictors</td>
<td>B</td>
<td>SE</td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>------------</td>
<td>----</td>
<td>-----</td>
<td>-----</td>
<td>--------</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family monthly income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily pocket money</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Results of the logistic regression analysis.
Factors associated with smoking

Logistic regression analysis was performed to know which factors were associated with smoking behavior (see Table 4). Daily pocket money and academic achievement were the only sociodemographic predictors in model 1. In model 2, attitude, social modeling, social norms, social pressure, and self-efficacy were found to be significantly associated with smoking behavior. Furthermore, these sociocognitive factors mediated the effect of the demographic factors, which were significant in model 1. Adding these sociocognitive factors also improved model fit significantly and explained an additional 68% of the behavior variance ($\chi^2 = 543$, $p < 0.01$). In model 3, the addition of intention resulted in a borderline significant improvement of the model fit and a non-significant increase in explained variance ($\chi^2 = 2.92$, $p = 0.09$).

Discussion

The first goal was to describe smoking prevalence among Saudi male adolescents and to obtain indicators of the tobacco epidemic stage. Smoking prevalence rates ranged from 35% at age 12 to 43.6% at age 15, which is higher than previously reported studies (Al-Damegh, Salih, Al-Fiffy, &...
Yet, in comparison to other Arab countries, prevalence was similar to that reported among young people in Yemen (43%), and lower than in Lebanon: 53% (Mohammed et al., 2006). Hence, in spite of Islam being the main component of the local culture (Piko, Luszczynska, Gibbons, & Tekzel, 2005), Muslims scholars do not hold a unified position towards smoking, some consider smoking as unfavorable while others think it is totally prohibited. However, differences in smoking prevalence require a deeper understanding of the (social) mechanisms.

According to the four-stage model of cigarette consumption (Lopez et al., 1994), smoking uptake increases rapidly from less than 15% among men in the first stage to a peak of 50–80% in the second stage. Female prevalence lags behind that of men by one or two decades and prevention efforts are limited. Then smoking prevalence declines among men to 40% and female smoking starts to decline at the end of this stage. The fourth stage is characterized by a slow decline in smoking prevalence for both sexes (Lopez, Neil, & Tapani, 1994). These stage mechanisms may not directly be transferable to Saudi Arabia where the social norm is that women should not smoke. Nevertheless, the higher smoking rates among more affluent adolescents reported in this study and the significantly lower smoking uptake rates among females reported by other studies (Bassiony, 2009) potentially suggest that the smoking epidemic in Saudi Arabia may still be in stage 1 or at the start of stage 2, which implies that much can be gained by developing a wide range of preventive actions and halting the epidemic at an early stage. To achieve this, the Tobacco Control Programme in Saudi Arabia is recommended to target adolescents with smoking prevention programmes that enhance adolescents’ self-efficacy, refusal skills and help them to cope with pressure. Related sectors of education, media and civil society should also be involved.

Concerning the second goal, the assessment of motivational differences between smokers and non-smokers, the results revealed that smokers had a relatively positive attitude towards smoking and non-smokers a more negative attitude. Yet, non-smokers were less negative about smoking concerning the relaxation and confidence effects. This may imply that they overestimate the potential relaxing effects of smoking as well as the notion that smoking boosts confidence. In line with results found in other studies demonstrating direct and indirect social influences (Amin, Amr, & Zaza, 2011; Mercen, Candel, Willem, & de Vries, 2009), our results showed that peers and...
Smoking uptake, tobacco epidemic indicators and preventive actions needed

Other have a significant influence on smoking behavior, a finding that supports the importance of peer influences for smoking behavior and one that started to receive attention in 1978 from Richard Evans and colleagues (1978) and led to the development of the social inoculation approach in many countries, helping young people to cope with different forms of pressure (Hansen & Graham, 1991). The importance of self-efficacy for preventing smoking onset has also received ample attention (de Vries, Dijkstra, & Kok, 1988; Hiemstra, Ott, & Kuhlman, 1996; Tocque, 2011). Our results support this finding and also support the importance of being capable to resist...
Chapter 3

...the method used to validate the respondents’ answers by using an algorithm. In addition, anonymous self-reports in general showed agreement with biochemical markers and reliable (Evans et al., 1977). Second, our study has a cross-sectional design, thus precluding causal inferences. Longitudinal studies are therefore recommended. Thirdly, as action planning and enactment have been shown to determine the translation of intentions to behaviour, future research should also include these factors (de Vries, Eggers, & Bolman, 2013). Fourthly, not to have the approval to include female adolescents limits the scope of our conclusions.

Acknowledgements

...
References


Chapter 3


Smoking uptake, tobacco epidemic indicators and preventive actions needed


Chapter 3


Factors associated with smoking initiation among Saudi male adolescents: A longitudinal study

This chapter is published as:

https://doi.org/10.18332/tpc/109167
Abstract

Introduction

Knowing country-specific predictors of smoking behavior for adolescents is crucial for successful smoking prevention programs. This study aims to assess demographic and socio-cognitive variables related to smoking initiation among Saudi male adolescents.

Methods

Longitudinal data were collected at T1 (baseline) and at T2 (follow-up at 6 months) using a self-administered questionnaire. We assessed smoking behavior and related demographic variables and socio-cognitive variables. Chi-squared tests and independent samples t-tests were used to identify differences in baseline characteristics between smokers and non-smokers at T1. Further more, non-smokers at T1 were included in logistic regression analyses to examine the predictors of smoking initiation between T1 and T2.

Results

At T1, the non-smokers who were included in further analysis were 523 (84.9%) of whom 48 (9.2%) had initiated smoking at T2. They differed significantly from non-initiators, including having a more positive attitude towards smoking, reporting more social norms, modeling and pressure to smoke, having lower self-efficacy to refrain from smoking and higher intention to smoke in the future (all p<0.001). The regression analysis revealed that: adolescents with disrupted families, being of low academic achievement, with relatively high monthly income families, having more smoking peers, high perceived pressure to smoke from parents (p<0.002) and teachers (p<0.001), having smoking-supportive norms of parents and having high intention to smoke in the future (p<0.001) were at higher risk of being smokers.

Conclusions

Findings suggest that health-promoting programs should address strengthening of self-efficacy and enhancing refusal skills against modeling of peers, pressure and norms of parents.

Keywords: Adolescents, I-Change Model, smoking initiation, smoking predictors, Saudi Arabia
Factors associated with smoking initiation: A longitudinal study

Introduction

Smoking remains one of the major public health problems. It is associated with different types of morbidities, including cancers, heart of the body are negatively affected by smoking (Saquib et al., USDHHS, 2014). Smoking is the number one preventable cause of death (World Health Organization [WHO], 2018). Smoking experimentation and initiation mostly occur during adolescence (Agaku, Ayoyu-Yusuf, Varadavas, & Connolly, 2014); approximately 40% of smokers start by this age (Staff, Maggs, Ploubidis, & Bonell, 2018) and it is estimated that 88% of adults who smoke daily started smoking by the age of 18 years (USDHHS, 2012). Early smoking initiation is associated with difficulty in quitting, being a regular smoker as adults (Campbell et al., 2008) and with susceptibility to addiction (Warren, Jones, Eriksen, Asma, & GTSS collaborative group, 2006). The Integrated-Change Model (de Vries, 2017; de Vries, Kremers, Smeets, Brug, & Eijmael, 2008) integrates several cognitive models to understand and change health behaviour. It originated from the Attitude-Social Influence-Self-efficacy (ASE) model, which is based on the Theory of Reasoned Action (Ajzen & Fishbein, 1975). The model incorporates insights from the Social Cognitive Theory (Bandura, 1986) and goal setting theories (Latham & Locke, 1991). The model assumes that intention is the most proximal predictor of behaviour, which in turn is influenced by a person’s attitude comprising cognitive and emotional advantages and disadvantages, social influence beliefs (i.e., norms about smoking, smoking behaviour by others, and social pressure), and self-efficacy. Additionally, the most recent version acknowledges pre-motivational and post-motivational determinants (de Vries, 2017). Investigation of smoking behaviour predictors among adolescents is an essential step to develop and design a successful smoking prevention programme. The social influence approach to study smoking behaviour was developed for the first time by Evans in 1976 when with colleagues addressed the impact of social pressure to smoke from parents, media, and peers (Evans et al., 1978). In 1994 the report of the Surgeon General of the United States Department of Health and Human Services clearly showed that smoking initiation was associated with psychological and social factors (Elders, Perry, Eriksen, & Giovino, 1994). Using longitudinal data, de Vries, Backhuis, & Dijkstra (1995) found that the social influence constructs (social norms, perceived smoking behaviour, and direct pressure) in addition to self-efficacy and intention were...
Chapter 4

Significant predictors of adolescent smoking behaviour. In a review with 53 longitudinal studies, published between January 1984 and August 2015, ninety-eight potential predictors were identified, including increased age/grade, poor academic performance, lower socioeconomic status, intention to smoke in the future, smoking family members, smoking friends, exposure to smoking promoting films and tobacco promotion efforts, against which high self-efficacy was found to be protective (Wellman et al., 2016). In Saudi Arabia, several studies investigated smoking predictors among adolescents. Results were similar to those found in international studies. Al-Zalabani and Kasim (2015) in their cross-sectional study found that having smoking friends, parental smoking, exposure to cigarette advertisements in mass media, and higher pocket money were risk factors for smoking initiation. Al-Makadma, Moynihan, Dobson, and Saewyc (2015) in their survey findings were supported by Al-Sabai (2020) who also found age, studying in private schools, having friends who smoke, perceived poor health and dissatisfaction with life as predictors of smoking onset.

The aim of this paper is to investigate the predictors of smoking initiation among Saudi male adolescents to guide the development of smoking prevention programmes for this target group.

Methods

Sampling

As part of the development of a smoking prevention programme targeting school-going adolescents in Taif, Saudi Arabia, secondary schools were approached to participate in a two-armed cluster randomized controlled trial. Nine schools were randomly selected to represent the control group. To select participants, students were given the chance to pick one of two papers in which either 'Included' or 'Excluded' were written. Out of the 707 included, twenty-four students did not fill in the questionnaire, resulting in 683 (96.6%) participants. In the current study, we analyse the data of the control group only for whom baseline (T1) and at 6 months (T2) longitudinal data were obtained. Only boys were included in the study, since the educational system in Saudi Arabia is gender-specific and smoking is officially not considered a problem for girls (Bassioni, 2009).
Factors associated with smoking initiation: A longitudinal study

**Ethical approval**

The data were collected with the approval of the General Director of Education, school health programme and school masters. Participants were given the right not to participate or stop at any time, as was explained prior to filling in the questionnaire.

**Questionnaire**

The questionnaire used was a modified version of the European Smoking Prevention Framework (ESFA) based on the I-Change Model (de Vries 2017; de Vries, Mudde, et al., 2003). Translation to Arabic and back-translation was done by a public health expert, with some modifications to fit with Saudi norms and culture. The questionnaire was pretested in a focus group for participants from the same selected schools and accordingly some adaptations were made. The questionnaire assessed demographics, attitudes, social influences, self-efficacy, intention not to smoke in the future and smoking behaviour.

Demographic factors included were: age (months), school area (rural = 1, urban = 2), school type (governmental = 1, private = 2), family monthly income (US$) (less than US$ 800 = 1, US$ 800 and less than US$ 1600 = 2, US$ 1600 and less than US$ 2400 = 3, US$ 2400 or more = 4) , daily pocket money (less than US$ 2 = 1 and US$ 2 or more = 2) , academic performance for the last year final exam (higher = 1, middle = 2 or lower third of the class = 3), and family structure (stable family, i.e. lives as one family with the father and mother = 1, disrupted family, i.e. lives with the father but the father has another wife, parents are divorced, or one or both parents are dead = 0).

Attitude was assessed using a 7-point Likert scale with 9 items: 1) very pleasant/very unpleasant, 2) very much more confident to be part of the crowd/very much less, 5) very much friendly/very much unfriendly, 6) very much sociable/very much unsociable, 7) tastes really very nice/tastes really very horrible, 8) friends pay much more attention if I smoke/pay much less attention, and 9) much easier to start talking with others/much more difficult; (Cronbach’s α for T1=0.78, α for T2=0.79).

Social influence beliefs were measured using three constructs: social modelling, social norms, and perceived social pressure 19. Social modelling was assessed by asking respondents to indicate the occurrence of smoking among: 1) very desirable/very undesirable, 3) makes me feel very relaxed/makes me feel very stressed, 4)...
Chapter 4

smoking behavior of important people in their environment (father, mother, brother, sister, best friend, friends, teachers and classmates) (does not smoke / the majority does not smoke = -1, do not know / not present = 0, smokes / the majority smokes = 1)

(\alpha_{T1}=0.67, \alpha_{T2}=0.69) . Social norms were measured by asking whether respondents believed that these people felt that they should smoke or not (definitely yes = 3, definitely no = -3) (\alpha_{T1}=0.97, \alpha_{T2}=0.98). To measure perceived social pressure to smoke the respondents were asked whether they experienced pressure to smoke from the same eight people (never = 0, few times = 1, sometimes = 2, often = 3 and very often = 4) (\alpha_{T1}=0.86, \alpha_{T2}=0.88).

Self-efficacy was assessed using a 7-point Likert scale by asking the adolescents to indicate how easy not to smoke = -3) . The situations measured were: with another who smokes, with friends who smoke, when offered a cigarette by someone, or by a friend, on the way home from school, while watching TV, doing homework, going out with friends, stressed, upset, depressed, nervous, worried, and when shopping (\alpha_{T1}=0.98, \alpha_{T2}=0.98).

Intention not to smoke was asked by four items on a 7-point scale to assess whether adolescents had the intention to smoke in the next 6 months, the next year, the next five years and in the future (definitely yes = ; definitely no = -3) . Intention not to smoke was asked by four items on a 7-point scale to assess whether adolescents had the intention to smoke in the next 6 months, the next year, the next five years and in the future (definitely yes = ; definitely no = -3) . Intention not to smoke was asked by four items on a 7-point scale to assess whether adolescents had the intention to smoke in the next 6 months, the next year, the next five years and in the future (definitely yes = ; definitely no = -3) . Intention not to smoke was asked by four items on a 7-point scale to assess whether adolescents had the intention to smoke in the next 6 months, the next year, the next five years and in the future (definitely yes = ; definitely no = -3) .

Smoking status was defined when the adolescent indicated that he had smoked at least once a week or daily, and when he reported that he smoked 100 cigarettes or more, unless he reported that he had quit. An adolescent was coded as a non-smoker when he had quit smoking, smoked monthly / occasionally, or experimented with smoking. An algorithm with four questions was used to validate self-reported smoking status (number of cigarettes smoked last day, last week, last month and lifetime any inconsistency in response was resolved by recoding to the most unfavorable response (de Vries, al., 2003) .

Statistical analysis

Chi-squared tests and t-tests were used to assess the baseline differences in demographic and socio-cognitive factors between smokers and non-smokers at T1, and between smoking initiators and not smoking initiators, where smoking initiation is assessed between T1 and T2. Logistic regression analyses were used to identify independent risk factors for smoking initiation between T1 and T2.
Factors associated with smoking initiation: A longitudinal study

As in the order prescribed by the I-Change Model, three separate models were built using a forward stepwise selection model, as the number of potential risk factors was too large to be included all at once in a model. The following variables were considered to be included in the models: only demographics in Model 1, demographics plus motivational constructs (attitude, social influences [modeling, pressure and norms] and self-efficacy) in Model 2, and demographics, motivational constructs, and intention in Model 3. The variables, which were significantly related to the outcome in Model 1, were also considered to be included in Model 3, but did not appear in the final Model 3 as they were no longer significant. In all analyses, the dependent variable was smoking status at T2, where only non-smokers at T1 were included to address smoking initiation between wave 1 (T1) and 2 (T2). As sensitivity analysis, the three final logistic regression models were repeated with the general estimated equation (GEE) analysis, accounting for the nesting of adolescents within schools (exchangeable structure). Assumptions were checked using variance inflation factors (>10 indicates a (multi) collinearity problem), Cook’s distances (>1 indicates an influential outlier problem), and tests on quadratic terms (if the centered quadratic term is significant, the linearity assumption is violated). All data analyses were performed using IBM SPSS Statistics for Windows (version 24.0, Armonk, NY: IBM Corp). Two-sided p-values ≤0.05 were considered statistically significant.

Results

Of the 707 adolescents, 683 (96.6%) filled in the questionnaire at both time intervals; 67 of these
Smokers at T1 were more often from a disrupted family, had more daily pocket money, and belonged less often to the higher third of the class than non-smokers (all p < 0.001) (Table 1).

Table 1: Socio-demographic characteristics of the respondents distributed by smoking status at T1, for 616 adolescents, Saudi Arabia.

<table>
<thead>
<tr>
<th>Items</th>
<th>Categories</th>
<th>Non-smokers N= 523(48.9%)</th>
<th>Smokers N=93(15.1%)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family structure</td>
<td>Stable</td>
<td>445 ( 85.6%)</td>
<td>75 (14.4%)</td>
<td>≤.001</td>
</tr>
<tr>
<td></td>
<td>Disrupted</td>
<td>78 (81.3%)</td>
<td>18 (18.7%)</td>
<td></td>
</tr>
<tr>
<td>Family monthly income</td>
<td>≥ 800 &amp; &lt; 1600</td>
<td>94 (90.4%)</td>
<td>10 (9.6%)</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>≥ 1600 &amp; &lt; 2400</td>
<td>130 (89.0%)</td>
<td>16 (11.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 2400</td>
<td>176 (81.1%)</td>
<td>41 (18.9%)</td>
<td></td>
</tr>
<tr>
<td>Daily pocket money</td>
<td>&lt; 2</td>
<td>275 (91.7%)</td>
<td>25 (8.3%)</td>
<td>≤.001</td>
</tr>
<tr>
<td></td>
<td>≥ 2</td>
<td>248 (78.5%)</td>
<td>68 (21.5%)</td>
<td></td>
</tr>
<tr>
<td>Academic performance</td>
<td>Among the higher third of the class</td>
<td>286 (94.0%)</td>
<td>18 (6.0%)</td>
<td>≤.001</td>
</tr>
<tr>
<td></td>
<td>Among the middle third of the class</td>
<td>150 (80.2%)</td>
<td>37 (19.8%)</td>
<td>≤.001</td>
</tr>
<tr>
<td></td>
<td>Among the lower third of the class</td>
<td>87 (69.6%)</td>
<td>38 (30.4%)</td>
<td></td>
</tr>
<tr>
<td>Urban School area</td>
<td>Urban</td>
<td>483 (85.5%)</td>
<td>82 (14.5%)</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>40 (78.4%)</td>
<td>11 (21.6%)</td>
<td></td>
</tr>
<tr>
<td>School type</td>
<td>Public</td>
<td>462 (85.6%)</td>
<td>78 (14.4%)</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td>61 (80.3%)</td>
<td>15 (19.7%)</td>
<td></td>
</tr>
</tbody>
</table>
Factors associated with smoking initiation: A longitudinal study

At T2, whereas 48 (9.2%) initiated smoking between T1 and T2. Adolescent smokers scored on average significantly higher on self-efficacy, and lower on attitude towards smoking and intention to smoke than smoking initiators (all p < 0.001). The analysis of social influence items showed that smoking initiators scored significantly higher than non-initiators on all items assessed (all p < 0.001), except for the social pressure from the mother (p=0.32) and sister (p=0.68) and modeling of mother (p=0.35) and sister (p=0.09). Analysis of the perceived social influence of parents and peer led to significant differences between the two groups for the three constructs assessed (Table 2).

Table 2: T-test for the cognitive factors at T1 and smoking initiation between T1 and T2, for 523 adolescents, Saudi Arabia.

<table>
<thead>
<tr>
<th>Items</th>
<th>Non-smokers N= 475</th>
<th>Smokers N=48</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M  SD</td>
<td>M  SD</td>
<td>≤.001</td>
</tr>
<tr>
<td>Attitude</td>
<td>1.00</td>
<td>0.70</td>
<td>1.31</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>0.66</td>
<td>0.47</td>
<td>1.20</td>
</tr>
<tr>
<td>Social Pressure</td>
<td>0.55</td>
<td>0.70</td>
<td>0.28</td>
</tr>
<tr>
<td>Father</td>
<td>0.00</td>
<td>0.00</td>
<td>0.04</td>
</tr>
<tr>
<td>Mother</td>
<td>0.00</td>
<td>0.00</td>
<td>0.05</td>
</tr>
<tr>
<td>Brother</td>
<td>0.67</td>
<td>1.60</td>
<td>0.15</td>
</tr>
<tr>
<td>Sister</td>
<td>0.38</td>
<td>0.08</td>
<td>0.05</td>
</tr>
<tr>
<td>Friends</td>
<td>1.09</td>
<td>3.25</td>
<td>0.54</td>
</tr>
<tr>
<td>Best friend</td>
<td>1.30</td>
<td>3.27</td>
<td>0.55</td>
</tr>
<tr>
<td>Classmates</td>
<td>1.11</td>
<td>2.58</td>
<td>0.60</td>
</tr>
<tr>
<td>Teacher</td>
<td>0.91</td>
<td>1.40</td>
<td>0.27</td>
</tr>
<tr>
<td>Social Norms</td>
<td>1.21</td>
<td>1.20</td>
<td>1.81</td>
</tr>
<tr>
<td>Father</td>
<td>1.27</td>
<td>0.83</td>
<td>2.20</td>
</tr>
<tr>
<td>Mother</td>
<td>1.25</td>
<td>1.27</td>
<td>2.18</td>
</tr>
<tr>
<td>Brother</td>
<td>1.51</td>
<td>1.46</td>
<td>2.00</td>
</tr>
<tr>
<td>Sister</td>
<td>1.27</td>
<td>0.79</td>
<td>1.97</td>
</tr>
<tr>
<td>Friends</td>
<td>1.64</td>
<td>1.06</td>
<td>1.47</td>
</tr>
<tr>
<td>Best friend</td>
<td>1.58</td>
<td>1.06</td>
<td>1.82</td>
</tr>
<tr>
<td>Classmates</td>
<td>1.63</td>
<td>1.65</td>
<td>1.33</td>
</tr>
<tr>
<td>Teacher</td>
<td>1.64</td>
<td>1.44</td>
<td>1.54</td>
</tr>
<tr>
<td>Parents</td>
<td>1.20</td>
<td>1.05</td>
<td>2.19</td>
</tr>
<tr>
<td>Items</td>
<td>Non-smokers N=475</td>
<td>Smokers N=48</td>
<td>P-Value</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------</td>
<td>--------------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Parent 1</td>
<td>1.71</td>
<td>1.21</td>
<td>1.20</td>
</tr>
<tr>
<td>Social model all</td>
<td>0.69</td>
<td>0.41</td>
<td>0.22</td>
</tr>
<tr>
<td>Mother</td>
<td>0.97</td>
<td>0.24</td>
<td>-1.00</td>
</tr>
<tr>
<td>Father</td>
<td>0.59</td>
<td>0.78</td>
<td>0.63</td>
</tr>
<tr>
<td>Brother</td>
<td>0.71</td>
<td>0.68</td>
<td>0.79</td>
</tr>
<tr>
<td>Sister</td>
<td>0.92</td>
<td>0.35</td>
<td>-1.00</td>
</tr>
<tr>
<td>Best friend</td>
<td>0.53</td>
<td>0.78</td>
<td>0.90</td>
</tr>
<tr>
<td>Classmates</td>
<td>0.68</td>
<td>0.66</td>
<td>0.38</td>
</tr>
<tr>
<td>Friends</td>
<td>0.63</td>
<td>0.70</td>
<td>0.67</td>
</tr>
<tr>
<td>Teachers</td>
<td>0.47</td>
<td>0.80</td>
<td>0.44</td>
</tr>
<tr>
<td>Parents</td>
<td>0.77</td>
<td>0.46</td>
<td>-0.19</td>
</tr>
<tr>
<td>Peers</td>
<td>0.70</td>
<td>0.45</td>
<td>0.35</td>
</tr>
</tbody>
</table>

In order to identify the predictors of smoking onset, we ran three logistic regression models, where all assumptions were met. If we only consider demographics (Model 1), adolescent with low academic performance, who were members of a disrupted family and had a relatively high family monthly income, were more vulnerable to initiate smoking than others. From Model 2, including demographics and motivational constructs, adolescents with more smoking peers (brothers, sisters, friends, best friend, and classmates) were at higher risk of being smokers too. Also, those with high perceived social norms of parents and pressure to smoke from parents (mostly the father) or teachers were more likely to smoke. Adding intention to demographics and motivational constructs (Model 3) suppressed the effect of peers modelling, and teachers’ pressure, while perceived...
Table 3: Results of logistic regression analysis for factors associated with smoking initiation between T1 and T2, for 48 smoking initiators, Saudi Arabia.

<table>
<thead>
<tr>
<th>Items</th>
<th>OR</th>
<th>95% C.I</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Family structure</td>
<td>0.07</td>
<td>0.03</td>
<td>0.17</td>
</tr>
<tr>
<td>Academic performance</td>
<td>(lower third of the class is the reference group)</td>
<td>≤.001</td>
<td></td>
</tr>
<tr>
<td>Among the highest third of the class</td>
<td>0.03</td>
<td>0.01</td>
<td>0.13</td>
</tr>
<tr>
<td>Model 1</td>
<td>Among the middle third of the class</td>
<td>0.22</td>
<td>0.09</td>
</tr>
<tr>
<td>Family monthly income (US $2400 or more is the reference group)</td>
<td>≤.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family monthly income less than US $800</td>
<td>0.97</td>
<td>0.25</td>
<td>3.83</td>
</tr>
<tr>
<td>Family monthly income US $800 &lt; US $1600</td>
<td>1.32</td>
<td>0.37</td>
<td>4.74</td>
</tr>
<tr>
<td>Family monthly income US $1600 &lt; US $2400</td>
<td>3.99</td>
<td>1.35</td>
<td>11.82</td>
</tr>
<tr>
<td>Family structure</td>
<td>0.10</td>
<td>0.03</td>
<td>0.35</td>
</tr>
<tr>
<td>Academic performance</td>
<td>(lower third of the class is the reference group)</td>
<td>≤.05</td>
<td></td>
</tr>
<tr>
<td>Among the highest third of the class</td>
<td>0.13</td>
<td>0.02</td>
<td>0.85</td>
</tr>
<tr>
<td>Model 2</td>
<td>Among the middle third of the class</td>
<td>0.36</td>
<td>0.11</td>
</tr>
<tr>
<td>Social norms Parents</td>
<td>2.39</td>
<td>1.60</td>
<td>3.58</td>
</tr>
<tr>
<td>Social pressure Parents</td>
<td>4.25</td>
<td>1.68</td>
<td>10.75</td>
</tr>
<tr>
<td>Social pressure Teachers</td>
<td>0.47</td>
<td>0.30</td>
<td>0.72</td>
</tr>
<tr>
<td>Social norms Parents</td>
<td>2.80</td>
<td>1.92</td>
<td>4.09</td>
</tr>
<tr>
<td>Model 3</td>
<td>Social pressure Parents</td>
<td>4.52</td>
<td>1.69</td>
</tr>
<tr>
<td>Intention</td>
<td>3.00</td>
<td>2.07</td>
<td>4.35</td>
</tr>
</tbody>
</table>

Discussion

Our findings about smoking behavior and academic performance support the findings of other studies and reviews in which smoking was more prevalent in adolescents with lower academic performance (Robert et al., 2019; Wellman et al., 2016). In line with other studies (de Vries, Mudde, et al., 2003; Kirby, 2002), smoking prevalence was higher among respondents from disrupted families. Smokers and non-smokers varied significantly in received daily pocket money, while family monthly income revealed the trend that smoking prevalence was higher among respondents of higher socio-economic status, in contrast to findings of similar studies in other
epidemic is at an early stage in Saudi Arabia and, as according to Lopez et al (Lopez, Collishaw, 2012; Laaksonen, Rahkonen, Karvonen, & Lahelma, 2020; Hiscock, Bauld, Amos, Fidler, & Munafö, 2012), differed significantly for all assessed social influence constructs, except for perceived modelling. Several international studies (Hiscock et al., 2012; Lopez et al., 2012; Laaksonen et al., 2020) have reported that higher pressure to smoke, more often had smoking parent (mostly father), peers and teachers, experienced smoking-norms, had higher attitudes towards smoking, less self-efficacy to refrain from smoking and a high intention to smoke in the future. Our findings are in line with international studies (Al-Zalabani, Kasim, 2015; de Vries, Mudde, Dijkstra, & Willemsen, 1999; Engel et al., 1994; de Vries, Mudde, Dijkstra, & Willemsen, 1998; Evans et al., 1978) showing that peer and parental norms, and peer and parental pressure supported by other studies (Van Ven, Engel et al., 2007) revealed that social influence can act directly on smoking.

**Limitations**

Our study had some limitations. First, only boys were included, because smoking among females was not considered a public health problem in Saudi Arabia; hence, we could not get...
Factors associated with smoking initiation: A longitudinal study

Girls’ schools. Secondly, six months is considered a relatively short period for behavior change. Thirdly, we could not biologically validate self-reports of smoking behavior. However, it is clearly documented that there is a high correlation between biochemical assessment of adolescent smoking behavior and self-reports, if confidentiality is preserved and anonymity assured (Dolcini, Adler, & Ginsberg, 1996), an approach that we also followed.

Conclusion

Findings of this study can help the school health programme and tobacco control programme in Saudi Arabia in shaping smoking prevention programmes for adolescents. Coping with pressure to smoke, refusal skills development and enhancing self-efficacy are essential elements to be considered for better outcomes from anti-smoking interventions.
References


Factors associated with smoking initiation: A longitudinal study


Health education research, 18(5), 627-636. https://doi.org/10.1093/her/cyg032

American Journal of Health Promotion, 22(6), 417-424. https://doi.org/10.4278/ajhp.22.6.417


Journal of Research on Adolescence

American Journal of Public Health


Evans, R. I., Rozelle, R. M., Mittelmark, M. B., Hansen, W. B., Bane, A. L., & Havis, J. (1978). Deterring the onset of smoking in children: Knowledge of immediate physiological effects...
Chapter 4

...and coping with peer pressure, media pressure, and parent modeling.


*Organizational behavior and human decision processes, 50* (2), 212-247. https://doi.org/10.1016/0749-5978(91)90021-K


*Tobacco control, 3* (3), 242.


Factors associated with smoking initiation: A longitudinal study


https://www.who.int/news-room/fact-sheets/detail/tobacco
Effects of a randomized controlled trial to assess the six-month effects of a school-based smoking prevention programme in Saudi Arabia

A modified version of this chapter is published as:

https://doi.org/10.1016/j.ypmed.2016.06.032
Abstract

Objective. To examine the efficacy of a smoking prevention programme which aimed to address smoking-related cognitions and smoking behaviour among Saudi adolescents aged 13 to 15.

Method. A randomized controlled trial was used. Respondents in the experimental group (N = 698) received five in-school sessions, while those in the control group (N = 683) received no smoking prevention information (usual curriculum). Post-intervention data was collected six months after baseline. Logistic regression analysis was applied to assess effects on smoking initiation, and linear regression analysis was applied to assess changes in beliefs and analysis of covariance (ANCOVA) was used to assess intervention effects. All analyses were adjusted for the nested structure of students within schools.

Results. At post-intervention respondents from the experimental group reported in comparison with those from the control group a significantly more negative attitude towards smoking, stronger social norms against smoking, higher self-efficacy towards non-smoking, more action planning to remain a non-smoker, and lower intentions to smoke in the future. Smoking initiation was 3.2% in the experimental group and 8.8% in the control group (p < .01).

Conclusion. The prevention programme reinforced non-smoking cognitions and non-smoking behaviour. Therefore, it is recommended to implement the programme at a national level in Saudi Arabia. Future studies are recommended to assess long-term programme effects and the conditions favouring national implementation of the programme.

Key words: smoking prevention, social influence, randomized trial, adolescents, Saudi Arabia.
Effects of a randomized controlled trial to assess the six-month effects of a school-based smoking prevention programme in Saudi Arabia

Introduction

Ri char d Evans pr ovi ded a new i mpet us i n t he pr evi ous cent ur y t o s moki ng pr event i on by out l i ni ng t hat  adol es cent s  of ten s t ar t  s moki ng due t o s oci al  i nf l uences  exer t ed by ot her s ,  s uch as  peer s , par ent s and t he mas s  medi a ( Evans et al . , 1978).  Thi s r es ul t ed i n a wi de ar ray of s t udi es on s moki ng prevention in the United States (Flay, 1985; Sussman et al., 1988; USDHHS, 2012; Vartiainen, Puska, Koskela, Nissinen, & Toumilehto, 1986) and Europe (Davis, Farrelly, Messeri, & Duke, 2009; Vries, 2006, 2010; Dijk, Mesters, & Vries, 2010; Garcia, 2013). Reviews clearly provided support for the effective approach (Dusenbury, Hansen, 2003; Hansen, 1992; Faggi ano et al., 2012; Wiehe, Garrison, Christakis, Ebel, & Rivera, 2005), but also concluded that most studies reported short-term effects up to a couple of years unless using a broader community approach (de Vries, 2007; Murray, 1992). Furthermore, most studies have been conducted in the United States, and none in Europe. Thus, the effect of this approach has been shown by many studies that tobacco use is rapidly increasing in Saudi Arabia and Arab countries (Amin, Amr, & Zaza, 2000; Islam & Johnson, 2000; Park, Al Agili, & Bartolucci, 2005; Rohrbach, 2010). Various studies have revealed a clear need for effective and evidence-based smoking prevention programmes in Saudi Arabia.

In Saudi Arabia, as in many other Arab countries, no momentum exists yet to promote smoking prevention, despite the mandate within the Framework Convention on Tobacco Control (FCTC) secondary junior high school students (12-13 years old) in Riyadh reported a prevalence of 3.2% (Ansary, & Kalantan, 1996). A later study by Bassiony (2009) estimated a much higher smoking prevalence, between 12 and 29.8%. Finally, a recent study (Mohammed, Vries, 2014a) estimated a prevalence of 39.6%. As morbidity and mortality are clearly linked to smoking uptake (USDHHS, 2014), this increase...
Chapter 5

...was also signed by Saudi Arabia (WHO, 2015). The FCTC clearly stipulates the need for the utilization of evidence-based smoking prevention methods to protect present and future generations from the devastating health, social, environmental, and economic consequences of tobacco consumption and exposure to tobacco smoke by providing a framework for tobacco control measures to be implemented by the parties at the national, regional and international levels (WHO, 2005). Consequently, there is a clear lack in evidence-based smoking prevention programmes in Saudi Arabia. Therefore, a new smoking prevention programme was developed, based on the results of an analysis of smoking prevalence and its determinants (Mohammed, Eggers, Alotaiy, de Vries, & de Vries, 2014c), revealing that a smoking prevention programme for boys was indicated but not for girls as smoking prevalence among this group was found to be almost nil (Al-Turki, 2006).

The goal of this paper is to describe the effects of a school-based smoking prevention programme after six months on smoking initiation concerning regular smoking behaviour, defined as smoking at least one cigarette per week and smoking-related cognitions such as attitudes, social influence beliefs, self-efficacy, and intentions.

Method

Sample and design

The design of this project was based on the European Smoking Prevention Framework Approach (ESFA). The project applied an integrative social cognitive model, the I-Change Model, to study smoking prevention in six European countries (Ariza et al., 2008; de Vries et al., 2003; Holm, Kremers, & de Vries, 2003; Hoving, Reubsaet, & de Vries, 2007; Lotrean et al., 2010), targeting...
Effects of a randomized controlled trial to assess the six-month effects of a school-based smoking prevention programme in Saudi Arabia

The estimated smoking prevalence of 15% was based on the median of previous smoking prevalence studies in Saudi Arabia (Bassiony, 2009; Jarallah et al., 1996; ... obtained due to low smoking prevalence among this group. At baseline (T1), 1,416 participants ... 438 -week programme was implemented in 24 classes of grade eight, distributed over 10 randomly selected schools, while nine schools were allocated to the control group. The target group consisted of male students only because the Saudi school structure entails gender-specific education, and no approval for this study among female students could be registered. Questions were read one after one by the data collector in the absence of teachers to ensure confidentiality of the response. Questionnaires were sealed in an envelope and collected by the research team for data management. Approval to conduct the study and to implement the intervention was gained from all relevant bodies within the school health programme in Taif province in Saudi Arabia.

Procedure

Baseline data was collected in December 2008; the five ... (Fig. 1). Participants were informed about the project, and were told that they had the right not to participate and to stop at any time they wanted. Questions were read one after one by the data collector in the absence of teachers to ensure confidentiality of the response. Questionnaires were sealed in an envelope and collected by the research team for data management.
Chapter 5

Figure 1: Respondents enrolment and follow-up.

All secondary schools in Taif province (N=79)

Schools accepted to participate (N=21)
Schools were excluded for having a running antismoking programme
Schools assigned for the study (N=19)

Registered students for participation (N=1381) .
Schools = 19.
Classes = 48
Students N = 709

Baseline data
Schools = 9,
Classes = 24
Students N = 707

6 months post intervention date
Schools = 9,
Classes = 24
Students N = 683

Randomly assigned for one of the two groups
Experimental (Received the intervention)
Effects of a randomized controlled trial to assess the six-month effects of a school-based smoking prevention programme in Saudi Arabia

The questionnaire

For this study, a translated version of the ESFA questionnaire was used with some cultural adaptations to make it fit with Saudi norms. Consequently, the questions assessing smoking behaviour, social norms, modeling and pressure from a girl friend or boyfriend were omitted (Mohammed et al., 2014).

Demographic factors

Socio-cognitive factors

(Acronbach’s α = 0.89). Intention using two items, intention to smoke in the future and in various situations (α = 0.98). Social norms using eight items (α = 0.92). Social pressure was assessed by eight items on a five-point scale and measured whether the participants had ever felt pressure from others to smoke (mother, father, brother(s), sister(s), best friend, friends, classmates, and teacher: +4 = very often; +3 = often, +2 = sometimes, +1 = few times and 0 = never) (α = 0.73). Social modeling was assessed: 0 = non-smoking; 1 = smoking for the same eight reference persons (α = 0.68).

Smoking behaviour

Smoking behaviour was categorized based on an algorithm used by earlier international studies on smoking prevention (Ariza et al., 2008; Ausems, Mesters, van Breukelen, & de Vries, 2002; de Vries et al., 2006; Lotrean, Mesters, & de Vries, 2013). A respondent was categorized as: (1) a never smoked not even one puff; had tried smoking once in a while but did not smoke anymore; had quit smoking; smoked less than once a week; or as (2) a smoker when the respondent indicated to smoke at least once a week; smoked daily; and when having reported smoking in the past 24 hours, last seven days, last month and lifetime smoking; 1 = smoking for the same eight reference persons (α = 0.73).
questionnaire are described elsewhere (Mohammed et al., 2014c; Mohammed, Eggers, Alotaiby,)

**Intervention**

The programme was derived from a Dutch prevention (De Vries et al., 1994), translated and adapted to Saudi local culture and norms. For instance, a training session about leading teamwork and team was conducted since school children in Saudi care were not used since these scenes were not in consistence with the local culture and norms. The programme used a video peer-led approach implying that the main theme was introduced on video by youngsters, followed by group work and active learning. Since active learning in groups and using peers as leaders were novel elements for Saudi schools, an introduction on how to work in groups was given. The intervention consisted of five lessons; each lesson took 45 minutes to be (actual time for one teaching session in Saudi Arabia). Trained school health care workers guided the intervention programme, while peer leaders who were selected by group members were trained on how to lead the discussion and how to make and present a summary. following each activity. For programme, see Table 1.

**Analysis**

Data entry and analysis was performed in SPSS 20.0. Chi assess baseline differences between the experimental and control group on demographic factors, cognitive factors and behaviour. Dropout analysis was carried out using logistic regression, with all demographic and socio cognitive factors included as covariates. At T2, 1383 participants numbers. The dropout rate was 1.3% for the control group and 1% for the experimental group. Analysis of covariance (ANCOVA) was used to assess intervention effects on the socio cognitive using SPSS. Logistic regression analysis was used to assess intervention effects on smoking initiation using the complex samples approach to adjust for clustering.
Table 1: The description of the intervention programme.

<table>
<thead>
<tr>
<th>Lessons</th>
<th>Activity No</th>
<th>Title</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Introduction to smoking prevention principles
- Benefits of team work
- Skills for group work
- Team leadership and skills
- Selection of teams' leaders

Lesson 1: Activity 1
- Smoking refusal
  - Reasons not to smoke: mentioned by participants
  - Discussions by groups and summary by groups' leaders.

Lesson 2: Activity 1
- Smoking and health
  - Smoking short and long-term effects on health
  - Diseases related to smoking behaviour.
  - Discussions by groups and summary by groups' leaders.

Lesson 2: Activity 2
- The annoying breath
  - Role play: Effect of passive smoking
  - Imagine that someone is smoking, his smoke affected you and you started coughing or your eyes were hurt, What is the approach to tell the smoker that his smoke is affecting others?
  - Discussions by groups and summary by groups' leaders.

Lesson 3: Activity 1
- Reactions to smoke or not to smoke
  - Watching videos showing interviews with adolescents each tells his personal experience, if he is smoker or not, and if he is; to mention the reasons why to smoke, and if he is not
  - Discussions by groups and summary by groups' leaders.
Chapter 5

<table>
<thead>
<tr>
<th>Lessons</th>
<th>Activity No</th>
<th>Title</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results

Sample characteristics
Finally, students from the experimental group had higher family income (see Table 2). When aggregated to the school level, no significant differences were observed between the control and experimental schools. Logistic regression analysis with dropout as the dependent variable showed that having less smokers in the social environment (i.e., social modeling) and being in the control group significantly predicted dropout (OR = 0.67; 95% CI: 0.49-0.92 and □ □ = 0.29; 95% CI: 0.12-0.68 respectively).

Table 2: Sample characteristics at baseline and differences between the experimental and control group.

<table>
<thead>
<tr>
<th></th>
<th>Total N = 1416</th>
<th>Control N = 707</th>
<th>Experimental N = 709</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>13.88 (0.60)</td>
<td>13.86 (0.60)</td>
<td>13.90 (0.61)</td>
</tr>
<tr>
<td><strong>School performance</strong></td>
<td>2.41 (0.70)</td>
<td>2.44 (0.71)</td>
<td>2.39 (0.72)</td>
</tr>
<tr>
<td><strong>Family income</strong></td>
<td>USD 1600 (277)</td>
<td>USD 1600 (230)</td>
<td>USD 1600 (391)</td>
</tr>
<tr>
<td><strong>School area</strong></td>
<td>Urban 210 (210)</td>
<td>Rural 170 (107)</td>
<td>Rural 262 (107)</td>
</tr>
<tr>
<td><strong>School type</strong></td>
<td>Governmental 82.9% (1174)</td>
<td>Private 17.1% (242)</td>
<td>Governmental 88.4% (625)</td>
</tr>
<tr>
<td><strong>Pocket money</strong></td>
<td>&lt;2 USD 49.2% (697)</td>
<td>≥2 USD 50.8% (719)</td>
<td>&lt;2 USD 50.5% (375)</td>
</tr>
</tbody>
</table>

Note: Reported differences are at the school level (N=19), ∗: p < 0.05; ∗∗: p < 0.01; ∗∗∗: p < 0.001
Table 3: Means, standard deviations and differences of socio-cognitive factors at baseline.

<table>
<thead>
<tr>
<th></th>
<th>Control Mean (SD)</th>
<th>Experimental Mean (SD)</th>
<th>Difference</th>
<th>t (1379)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atitude</td>
<td>-0.93 (1.54)</td>
<td>-1.01 (1.69)</td>
<td>-1.52</td>
<td>-0.33</td>
<td></td>
</tr>
<tr>
<td>Social norm</td>
<td>1.28 (1.77)</td>
<td>1.37 (1.76)</td>
<td>0.37</td>
<td>1.34</td>
<td></td>
</tr>
<tr>
<td>Social modeling</td>
<td>0.01 (0.66)</td>
<td>0.01 (0.63)</td>
<td>&lt;1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social pressure</td>
<td>0.42 (0.74)</td>
<td>0.45 (0.69)</td>
<td>&lt;1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>1.29 (1.89)</td>
<td>1.38 (2.00)</td>
<td>&lt;1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action planning</td>
<td>1.79 (1.42)</td>
<td>1.71 (1.40)</td>
<td>1.02</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>Intention</td>
<td>-1.51 (1.99)</td>
<td>-1.43 (2.06)</td>
<td>&lt;1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Adjusted for school area, school type, income; a: very negative (-3) to very positive (3); b: others think I definitely should smoke (-3) to others think I should definitely not smoke (3); c: high (4) to low (3); d: confident I will not smoke (3); e: certainly no (-3) to certainly yes (3); f: very often (4) to very often (3); g: the social environment; h: smoking is (1) to not smoking is (5).

Effects on socio-cognitive factors
Effects of a randomized controlled trial to assess the six-month effects of a school-based smoking prevention programme in Saudi Arabia

**Effects on smoking behaviour**

The results of the multilevel logistic regression analysis conducted to assess potential behaviour effects on smoking initiation, indicated that exposure to the smoking prevention programme led to a significantly lower risk to have initiated smoking at follow-up. School area, school type and family income were included as covariates to account for the baseline differences. Results showed that after six months, 8.8% of the non-smokers (46 out of 519) had initiated smoking in the control group versus 3.2% (17 out of 528) in the experimental group ($p = 0.019$). Consequently, the general prevalence rates of smoking at follow-up were 20.8% for the

Table 4: Mean differences in socio-cognitive factors between follow-up and baseline (T2-T1).

<table>
<thead>
<tr>
<th></th>
<th>Control $\Delta$ Mean (SE)</th>
<th>Experimental $\Delta$ Mean (SE)</th>
<th>Difference</th>
<th>$F(1,18)$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Norm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Modeling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action planning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Adjusted for school area, school type, income, and clustering

**Evaluation of the intervention programme**

Following the implementation of the intervention programme, the views and opinions of participants and the school health workers, who enhanced providing the programme, were assessed. The new approach we applied to vote for selecting the groups’ leaders and the very good to (0) very bad, the top score was for the role play videos, working in groups, and using the peer-led approach (each scored 5) on average, while the remaining items each scored (4) points on average (Table 5). Health care workers, who enhanced the programme, positively evaluated the programme, although they had their comments on the number of lessons which were 5 lessons and
Table 5: Summary of programme evaluation by participants.

<table>
<thead>
<tr>
<th>Programme’s items</th>
<th>Evaluation a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role play video</td>
<td>5</td>
</tr>
<tr>
<td>To work in groups</td>
<td>5</td>
</tr>
<tr>
<td>Peer-led approach</td>
<td>5</td>
</tr>
<tr>
<td>Groups leaders selection by voting</td>
<td>4</td>
</tr>
<tr>
<td>Enhancement of the programme by health care worker</td>
<td>4</td>
</tr>
<tr>
<td>Number of lessons</td>
<td>4</td>
</tr>
</tbody>
</table>

Discussion

This study is the first study in Saudi Arabia that assessed the short-term effects of a school-based smoking prevention programme for Saudi youngsters in grade eight (age 13–15). Students who were exposed to the programme had stronger non-smoking attitudes, higher self-efficacy to cope with peer and social pressure, more action planning and lower intention to smoke in the future.

Smoking initiation at six-month follow-up was significantly lower in the experimental group than in the control (8.8% versus 3.2%), indicating that the intervention was highly effective. The results support earlier findings that stem from the six countries European Smoking Prevention Framework (Johnson, 2005) and translation of these results for Arab youngsters in the US for smoking. Our results support that adaptation of socio-cognitive approaches to prevent or delay smoking behaviour in Arabic cultures can be feasible and effective. Yet, more research is needed to demonstrate longer-term effects as smoking prevention programme effects have found to be limited...
in duration (Dobbins, DeCorby, Maske, & Goldblatt, 2008; Müller-Riemenschneider et al., 2008; Peterson, Kealey, Mann, Marek, & Sarason, 2000; Wakefield & Chaloupka, 2000).

The positive effects of the intervention on self-efficacy and the adoption of action plans were also apparent in previous studies that used a similar approach to develop a school-based smoking prevention programme for vocational schools in the Netherlands and are also consistent with the results of other similar European studies (de Vries et al., 1994; Gorini et al., 2014; Lotrean et al., 2010).

One important limitation for this study was that we could not biologically validate the smoking self-report due to financial and logistic constrains. However, adolescents’ self-reports about smoking have been found to be in high concordance with biological indicators when anonymity was used (Dolcini, Adler, & Ginsberg, 1996; Hansen, 1992; Murray & Perry, 1987).

An important implication for tobacco control practice in Saudi Arabia is that recommended shift from the current passive approach (that mostly limited merely providing knowledge about the effects of smoking) into a more pro-active approach that aims at reinforcing non-smoking beliefs and skills. First, this requires an analysis of the facilitating and hindering factors for adoption of school-based smoking prevention programmes in Saudi Arabia. Second, it requires experimental studies that evaluate the long-term effectiveness of interventions aimed at motivation enhancement, life skills (such as stress-coping, self-control), decision-making components, and specific quit strategies for those need (Sussman, Arriaza, & Grigsby, 2014) well as integral approach encompassing the broader community (de Vries et al., 2006) well as supporting policies, such as increasing the price of tobacco (Kostova, Ross, Blecher, & Markowitz, 2011) and non-smoking areas (Wakefield et al., 2008).

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not for profitable sectors
References


Effects of a randomized controlled trial to assess the six-month effects of a school-based smoking prevention programme in Saudi Arabia


Chapter 5


Effects of a randomized controlled trial to assess the six-month effects of a school-based smoking prevention programme in Saudi Arabia


Lot rean, L. M., M est er s, I., & de Vr i es, H. (2013). Why do Romani an j uni or hi gh s chool s t udent s s t ar t t o s moke? Child: Car e, Heal t h and Devel opment, 39(6), 851-855. https://doi.org/10.1111/j.1365-2214.2012.01428.x

Luna-Adame, M., Car r as co-Gi ménez, T. J., & Rueda-Gar cí a, M. d. M. (2013). Evauat i on of t he ef fect i venes s of a s moki ng pr event i on pr ogram bas ed on t he ‘Life Ski l ls Training’ app roach. Health Eduecation Research, 28(4), 673-682. https://doi.org/10.1093/her/cyt061

Mazi ak, W., War d, K., & Ei s s enber g, T. (2004). Fact ors r el at ed t o f r equency of nar ghi l e (wat er pi pe) us e: t he f i r s t  i ns i ght s on t obacco dependenc e i n nar ghi l e us er s. Drug and Alcohol Dependence, 76(1), 101-106. https://doi.org/10.1016/j.drugalcdep.2004.04.007


Mül l er-Ri emens chnei der, F., Bockel br i nk, A., Rei nhol d, T., Ras ch, A., Gr ei ner, W., & Wi l l i ch, S. N. (2008). Long-t er m ef fect i venes s of behavi our al i nt er vent i ons t o pr event s moki ng among chi l dr en and yout h. Tobacco Control, 17(5), 301-302. https://dx.doi.org/10.1136/tc.2007.024281


Per r y, C. L., Kel der, S. H., Mur r ay, D. M., & Kl epp, K. I. (1992). Communi t ywi de s moki ng pr event i on: l ong-t er m out comes of t he Mi nnes ot a Hear t  Heal t h Pr ogr am and t he Cl as s  of 1989 St udy. American Journal of Public Health, 82(9), 1210-1216. https://doi.org/10.2105/AJPH.82.9.1210
Chapter 5


Vartiainen, E., Puska, P., Koskelo, K., Niissinen, A., & Toumilehto, J. (1986). Ten-year results of a community-based anti-smoking program (as part of the North Karelia Project in Finland. *Health Education Research, 1*(3), 175-184. [https://doi.org/10.1093/her/1.3.175](https://doi.org/10.1093/her/1.3.175)
Effects of a randomized controlled trial to assess the six-month effects of a school-based smoking prevention programme in Saudi Arabia

Wakefield, M., & Chaloupka, F. (2000). Effectiveness of comprehensive tobacco control programmes in reducing teenage smoking in the USA. Tobacco control, 9, 177-186. https://dx.doi.org/10.1136/tc.9.2.177


General discussion
Chapter 6

Introduction

This final chapter summarizes the results of the different studies included in this thesis and discusses the main findings of the determinant studies (Chapters 2 and 3) and longitudinal study (Chapter 4), the effect of the intervention (Chapter 5), and the added value of each.

The discussion in this concluding chapter is organized as follows: first, it describes the formative studies – the qualitative and quantitative determinant studies – that were carried out in order to prepare programme development. Next, the smoking prevention programme development and testing is described. Then, lessons learnt from the development and implementation of the intervention will be discussed. The chapter ends by providing recommendations for tobacco control programmes for the future of smoking prevention in Saudi Arabia (SA).

Preparation for the programme’s development

In order to enhance behaviour change, health promotion frameworks have been used to plan, design, and evaluate interventions. A Dutch smoking prevention programme for vocational schools, by de Vries and colleagues (de Vries et al., 2007), which is a variation on Green and Kreuter’s (1992) PRECEDE-PROCEED Model. The development of health promotion intervention programmes was based on a programme matrix (de Vries, Mudde, Leijts, et al., 2003), following principles of McGuire (Green & Kreuter, 1992). Other approaches were used as well, such as an intervention mapping protocol (Kok, Bartolomew, Parcel, Gottlieb, & Fernandez, 2014), which provided detailed guidance for the behavioural needs assessment and described six steps needed for designing interventions: (1) a needs assessment, (2) matrices, (3) theory-based methods and practical applications, (4) an intervention programme, (5) adoption and implementation, and (6) an evaluation protocol. A related approach is the pragmatic approach by Cheung, Hors-Fraile, and de Vries (2021), which outlines how to use the integrated model for behaviour change (the I-Change Model) to design intervention programmes. Cheung and colleagues defined four steps that can be taken to design a theory- and evidence-based behaviour change programme: (1) choosing the appropriate theoretical model, (2) setting the intervention goal and objectives of the programme, (3) identifying salient beliefs using...
General discussion

Theoretical framework (the I-Change Model)

Step 1 of the pragmatic approach is to choose an appropriate theoretical framework (Cheung et al., 2021). The choice of model is based on the factors to be addressed and whether the model discusses these factors. For this thesis, the I-Change Model was used. The I-Change Model is an integration model, integrating factors of various social cognitive theories and models aiming at understanding and changing behaviour (de Vries, 2017). It incorporates insights from Social Cognitive Theory (Bandura, 1986), the Health Belief Model (Janz & Becker, 1984), the Transtheoretical Model (Prochaska & DiClemente, 1982), and the Theory of Planned Behaviour (Ajzen, 1991). The I-Change model distinguishes three phases in the behaviour change process: the pre-motivational phase, determined by knowledge and awareness of one’s own behaviour and level of personal risk; the motivational phase, determined by attitudes, perceptions of influence, and self-efficacy beliefs regarding change; and post-motivational processes, action plans, and skills building. These processes are determined by four distal types of influence: behavioural factors (e.g., acquisition of skills and previous experience with the same and related behaviours), psychological factors (such as self-esteem, anxiety, and depressed affect), biological factors (such as gender, age, and hereditary variables), and social and cultural variables (parenting styles, social climate, and socio-economic status and religion).

The I-Change Model has been previously used successfully to understand and change various types of health behaviours. For example, it was used to understand smoking behaviour in adolescents and study the effects of HIV intervention programmes in South Africa (Egger, Aaro, Bos, & Vries, 2003; de Vries, Mudde, Kremers, et al. 2003; de Vries, Mudde, et al. 2003; de Vries et al., 2006; Ariza et al., 2008) and to understand condom use...
Since the model was used to understand and change different types of behavior in different parts of the world with different cultural backgrounds, we chose it as our theoretical framework to investigate and change the smoking behavior of Saudi adolescents and to determine whether it can be successfully applied in the context of SA.

**Intervention goal and objectives**

Step 2 of the pragmatic approach is to choose the goal and objectives of the intervention program, based on the stage of the target group if they are already motivated to change.

Tobacco use among SA adolescents was documented in a recent review that included 32 studies (Alasqah, Mahmud, East, & Usher, 2019). The reported prevalence was somewhat higher than that among other age groups, whereas prevalence among boys was higher than among girls (12.4% – 39.6% versus 3.8% – 11.1%, respectively). This high prevalence indicates the need for an intervention program. Accordingly, the main goal of the smoking prevention program described in this thesis was to prevent smoking initiation among Saudi male adolescents aged 11 – 16 years. The studies described in this thesis had the following objectives:

1) To explore adolescents’ views on smoking and their opinions about a smoking prevention programme (Chapter 2).

2) To investigate whether social cognitive models, such as the I-Change model, can be successfully applied in order to understand and change the smoking behavior of Saudi adolescents (Chapters 3, 4, and 5).

3) To determine demographic differences between smokers and non-smokers (Chapter 3).

4) To assess differences between smokers and non-smokers concerning attitude, perceived social influences, self-efficacy, and intention regarding smoking (Chapters 3 and 4).

5) To study whether the resulting program changes adolescents’ attitudes towards non-smoking in a positive direction and whether the program is able to strengthen adolescents’ self-efficacy in terms of resisting social pressure, modeling, and norms (Chapter 5).

6) To study the effects of the program on smoking onset (Chapter 5).
Identification of salient beliefs

to identify the significance of these determinants (Cheung et al., 2021; de Vries, Weijts, Dijkstra, & Kok, 1992; Steckler, McCormick, & McLeroy, 1992) regarding smoking initiation among

determinants of smoking initiation. Chapter 2 describes the results of a study using a qualitative

cognitive perceptions related to smoking behaviour; which beliefs statistically explain smoking behaviour; and Chapter 4 describes the outcomes of a

Socio-demographic factors related to smoking

Change Model and addressing the constructs of the model: knowledge, risk perceptions,

interaction planning. Chapters 3 and 4 used a quantitative approach. The results of the three studies revealed that the smoking group tended to receive more daily pocket money and

(Almutairi, 2014; Alsubaie, 2020) and of an international study investigating the association between personal income and smoking among adolescents in six European cities (Perelman et al., smoking) more affluent, illustrates the early phase of the tobacco epidemic in the Middle East and Arab countries as described by Maziak et al. (2015), in line with Neirkens and colleagues’ study (Nierkens, de Vries, & Stronks, 2006). In the early phase, smoking is more common among the


households were more exposed to smoking (Cassidy, Aston, Tidey, & Colby, 2020; Cui, Forget, Zhu, Torabi, & Oguzoglu, 2019; Elton Marshall, Wijesingha, Kennedy, & Hammond, 2018; Gupt a, de Wi t , & McKeown, 2007) because they share cigarettes. In line with other local SA and international studies’ results (Al as qah et al., 2007; Al-

Pennanen, Haukkal a, de Vr i es , & Vart i ai nen, 2011), which have documented the relationship between academic performance and smoking, our study showed that students with low performance were more likely to smoke, whereas those with better academic performance were less likely to smoke. As recommended by some reviewers (Sher man & Primack, 2009) and based on these demographic findings, future school health promotion and smoking prevention programs should focus on those exposed to these risk factors for smoking initiation, namely adolescent from affluent families with extra pocket money and those with low academic performance.

Attitude towards smoking

The most notable difference between SA and the Netherlands, where the Dutch smoking prevention program by de Vr i es and Kok (1986) was developed and evaluated, concerns the role of religion in the respective cultures. In the Netherlands, religion did not play an important role as a determinant, and no specific religious context had to be taken into account. On the other hand, the Islamic religion plays a significant role in the society of SA.

At the time of project development, SA organized gender-specific education, and there were two different education directors: one for boys and another for girls. Second, smoking prevention research and interventions were allowed for boys only, as girls were supposed not to smoke. Consequently, the focus of the studies described in this thesis is on boys.

The results of our qualitative analyses (Mohammed, de Vr i es , Cheung, & de Vr i es ., 2020) described in Chapter 2 revealed that the non-smoking group perceived religion as a protective factor against smoking. This result supports the findings of other studies in SA (Al-

Gar r us i  & Nakhaee, 2012). Several of the consequences of smoking perceived by the boys and that are described in Chapter 3 were similar to the findings of studies in the Netherlands (Aus ems, Mest ers, van Br eukel en, & de Vr i es , 2003) and other Western countries (Hol m, Kr emer s , & de Faris, 1995; Almutairi, 2014, 2016; Al Nohair, 2011) and international studies and reviews (El Awa, 2004; First, 2005; de Vr i es & de Vr i es , 2005) identified in our quantitative analysis (Mohammed, Eggers, Alotaib y, de Vries, & de Vries, 2018).
Smokers had significantly more positive attitudes towards smoking: they indicated that they smoked because they did not believe in a negative impact of smoking on health, did not see alternatives for smoking, thought that smokers look more Westernized and are seen as adults (not kids but real men), and thought that cigarettes have a nice taste and that smoking may help people feel relaxed and confident. Non-smokers mentioned they did not smoke because of the nasty breath of smokers, the effect of smoking on health, and the belief that smoking is not compatible with their religion and thereby not acceptable for the local community.

Social influences and smoking behaviour

In line with findings of other studies in SA (Al Agili & Park, 2012; Alsubaie, 2020; Amin, Amr, Zaza, 2011) our qualitative and quantitative analyses described in Chapters 3 and 4 showed that non-smokers had fewer smoking friends and family members and perceived low or no pressure to smoke from others. In contrast, smokers indicated that they had more family members and friends who smoked, perceived a direct pressure from friends, their best friend, and family members to smoke (especially from their fathers and brothers) and indirect pressure to smoke from perceived modelling and norms. These findings were also in congruence with findings of the Dutch analysis, smoking analyses in six European countries (de Vries, Backbier, Kok, & Dijkstra, 1995; de Vries, Engels et al., 2003), and other international studies (Amin, Dunn, & Laranjo, 2020; Chassin et al., 2005; Evans et al., 1978; Orcullo San, 2016; Vitória, Pereira, Muinos, Lima, 2004) in which friends, the best friend, and family members were found to affect adolescents’ smoking behaviour.

As can be noted from the results of the qualitative and quantitative analysis, one difference between Dutch and European and Saudi adolescents’ social influence is the absence of mothers’ and sisters’ effects on the three social influence constructs for Saudi male adolescents’ behaviour. This is probably due to the fact that in SA, boys grow up with male family members (father, brothers, and uncles) and girls grow up with female family members (mother, sisters, and aunts). The impact of these male models on smoking-related norms and behaviour is thus much stronger than the impact of female models. A similar result was found by Atari in his study on gender differences in the prevalence and determinants of tobacco use among school aged adolescents (11–14 years) in Sudan and South Sudan (Atari, 2011) found that among individuals of the same sex in a household,
Chapter 6

The majority of male smokers have a male sibling who smokes. It is worth mentioning that, in order to adapt to Saudi and Islamic norms that prohibit friendship relations between boys and girls, questions about the effect of a female friend on different social constructs were not asked.

Self-efficacy

The concept of self-efficacy is defined as the confidence of a person to successfully perform a certain behavior in high-risk situations (Bandura, 1997). In our case, it is the expectation of being able to refrain from smoking in different situations. Similar to findings about Dutch adolescents' smoking behavior and those of other international studies and reviews (de Vries et al., 1995, 2006; Ezekiel, Stephen, & Mosha, 2018; Holm et al., 2003; Vitória, Salgueir & de Vries, 2011), smokers in our

Intention

Similar to Dutch adolescents and in agreement with international studies (Conner, 2019; de Vries et al., 1995, 2006; Ezekiel, Stephen, & Mosha, 2018; Holm et al., 2003; Vitória, Salgueir & de Vries, 2011), in which intention was the most powerful predictor in explaining present and Change Model and other health behavior theories (Bandura, 1986; Fishbein & Ajzen, 1975, 2010; Prochaska & DiClemente, 1982), which assume that intention is

smoking’s
Factors associated with smoking initiation among Saudi male adolescents: A longitudinal study

have documented the role of the family and family process (Chassin et al., 2005; Fleming, Kim, Harachi, & Catalano, 2002; Jester et al., 2019; Khalil, Shegog, & Fujimoto, 2020) academic performance (Forrester, Biglan, Severson, & Smolkowski, 2007; Karp, O’Loughlin, Paradis, Hanley, & Difranza, 2005) as predictors of smoking onset. In line with the published literature (de Vries, Engels, Kremers, Wetzels, & Mudde, 2003; Flay, 2009a, 2009b; Forrester et al., 2007; Khalil et al., 2020; Sussman et al., 1987; Tyc et al., 2004; Vink, Willemsen, Engels, & Boomsma, 2003), our results showed that adolescents who had a high intention to smoke in the future were at higher risk of being smokers after six months. Findings from this study support our

In conclusion, in this thesis, a qualitative (Chapter 2) and quantitative approach, cross-sectional study (Chapter 3), and longitudinal study (Chapter 4) were used to identify the determinants of adolescents’ smoking behaviour but were limited to the Western context. Moreover, the impact of family members and Islamic beliefs contributed to adolescents’ smoking behaviour.
The school-based smoking prevention programme

**Design of the school-based smoking prevention programme**

Step 4 of the pragmatic approach is to design the intervention programme, which addresses the determinants obtained from the qualitative and quantitative studies, which preceded the development of the intervention in step 3 of the pragmatic approach.

Saudi Arabia signed the Framework Convention on Tobacco Control (FCTC), which clearly stipulates the need for the utilization of evidence-based smoking prevention methods to protect present and future generations from the devastating effects of tobacco consumption and exposure in terms of health, social, environmental, and economic consequences (WHO, 2005). Yet, the tobacco control programme in SA was lacking a prevention approach. There is still a limited number of initiatives for smoking prevention in the sense of interventions targeting youth.

Although there are rules and policies regulating the sale of tobacco to minors and in schools (which is prohibited), these rules are not fully implemented. Moreover, smoking prevention programmes that not only target knowledge but also the motivational determinants of smoking are missing and are thus highly needed.

**Preferred didactics**

The results of the qualitative study described in Chapter 2 showed that almost all participants agreed that an interactive approach would be most effective, and they would participate if they were part of a peer-led programme with interactive activities and were not only passive recipients. These factors that adolescents mentioned as being their preferences for the required intervention programme were also mentioned in the literature as determinants of successful smoking prevention programmes with promising outcomes (Campbell et al., 2008; Sussman, Black, & Rohrbach, 2010).
Following the I-Change Model, a school-based smoking prevention programme was developed (Mohammed, Eggers, Alobaby, de Vries, & de Vries, 2016) to meet the recommendations of our studies, which recommended a pragmatic approach. It also followed recommendations of international studies and reviews for a successful smoking prevention programme (Campbell et al., 2008; Flay, 2009a, 2009b; Hansen, 1988). In this intervention programme, we used various behavioural techniques (Table 1). In line with the taxonomy of behaviour change methods of the intervention mapping approach (Kok et al., 2016), we addressed non-smoking attitudes, how to resist pressure to smoke, how to develop high self-efficacy towards non-smoking in various situations, and how to enhance refusal skills against pressure, modelling, and norms of peers and parents. The participants were given the chance to vote and select their groups’ leaders, and they engaged in role play as part of the approach we followed.

Table 1: The behaviour change methods and techniques used in the intervention programme

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Behaviour Change Methods</th>
<th>Behaviour Change Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td>Arguments</td>
<td>Video showing effects of smoking on health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evaluation of the norm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discussion about the norm</td>
</tr>
<tr>
<td>Social pressure</td>
<td>To social pressure</td>
<td>Role play and discussion</td>
</tr>
<tr>
<td>Social norms</td>
<td>Information about others’ approval</td>
<td>Interviews with adolescents and discussion</td>
</tr>
<tr>
<td>Social modelling</td>
<td>Mobilizing social support</td>
<td>Group work, discussion</td>
</tr>
<tr>
<td>Verbal persuasion</td>
<td>Public commitment</td>
<td>Discussion</td>
</tr>
<tr>
<td>Goal setting</td>
<td>Coping responses</td>
<td>Role play</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Refusal skills</td>
</tr>
</tbody>
</table>
Determinants | Behaviour Change Methods | Behaviour Change Techniques
---|---|---
Intention | Verbal persuasion | Argument discussion
 |

**Effect evaluation of the school-based smoking prevention programme**

The results described in Chapter 5 revealed that at follow-up after six months, respondents from the experimental group reported a significantly more negative attitude towards smoking, stronger social norms against smoking, higher self-efficacy towards non-smoking, more action planning to remain a non-smoker, and lower intentions to smoke in the future than respondents from the control group. The prevalence of smoking initiation (those who just began experimenting with smoking) was 3.2% in the experimental group and 8.8% in the control group. The programme efficacy was assessed within six months only.

Participants and health care workers, who enhanced delivering the intervention, evaluated the programme positively (Chapter 5). Yet the number of lessons, five, was rated as 4 points out of 5 (the minimum mean for an item in the evaluation). Additionally, programme providers preferred there to be more than five lessons and continuous activity in school. These suggestions are congruent with the recommendations of international studies and reviews (Flay, 2009a, 2009b; ).

**Comparison with other studies**

Our results can be compared to those of other interventions. Nurumal and colleagues developed a school-based intervention programme in Malaysia in 2019 (Nurumal, Zain, Mohamed, & Shorley, 2021) for grade five students from primary schools with a quasi-experimental design: none of the participants from the intervention group started smoking, while 2.9% of the control group reported to have smoked in the past seven days. Similar to our results, the mean scores of attitudes, subjective norms, and non-smoking intentions of the intervention group improved significantly. Their programme was composed of lectures with an educational video, group work, and active learning. They assessed their intervention after three months only, which might explain the higher efficacy of their programme, as it is documented that school-based smoking prevention intervention effects are congruent with the recommendations of international studies and reviews (Flay, 2009a, 2009b; ).
decay over time (de Vries et al., 2006; Wiehe, Garrison, Christakis, Ebel, & Rivara, 2005). Some reviews suggest that any intervention effect will decay over time if interventions are stopped or withdrawn (Flay, 2009a, 2009b). Another school-based smoking prevention intervention in 2013 by Teuku Tahlil and colleagues among grade seven and eight adolescents in Indonesia (Tahlil, Woodman, Covency, & Ward, 2013), using teachers as providers, divided the intervention group into three subgroups based on the intervention programme applied: health-based, Islamic-based, and combined programme. They conducted eight sessions on smoking prevention education months for each group and assessed their effects one week post the intervention. Their results differed from ours, as they had positive effects on knowledge and attitude only but did not realize effects on intention or behaviour and smoking initiation for the three intervention groups over the control group. Their findings could be explained by the very short period of post-intervention assessment (one week). In another randomized controlled trial in 2017 by Brinker and colleagues (2017), medical students delivered an education programme against tobacco at secondary schools in Germany, with two waves of assessments: after six and after 12 months. Their study groups consisted of 40 randomized classes who received the intervention, in which two medical students were interactive while 34 control were within the schools with no intervention. Their findings, from baseline to the two follow-up time points, showed that the prevalence of smoking increased from 5.2% to 7.2% in the control group and from 5.4% to 5.8% in the intervention group. The intervention effect was significant for female students and students with higher educational background only. This gender-specific effect (as they suggested) in the photo ageing application. Another German study by Iseensee, Hansen, Maruska, and Hanewinkel (2014) in grades five and six in 2014 consisted of 14 units and two workshops conducted by teachers. After six months, these had had a high impact on knowledge, attitude, and intention, a significant but small effect on behaviour, and almost no effect on self-efficacy. The latter can be explained by the perception of participants, as both groups considered themselves to be rather high self-efficacious to resist an offered cigarette throughout the study period. In an intervention from the programme (Lottean, 1994), Lottean and colleagues (2010) obtained a significant effect nine months post their school-based smoking prevention programme in Romania. Their findings in the experimental group was 4.5% and 9.5% in the control group, with significant differences.
Lessons learnt: What went well and what could be improved?

Other approaches

Author's analysis concluded that there was no effect on smoking initiation after 36 months. The prevalence for the intervention group and the control group was 10.8% and 12%, respectively (OR 0.90, 95% confidence interval = 0.63 – 1.27). These results might be due to the age of the participants (too young), the educational level of parents, which ranged from middle to high (low-risk group), or the time effect, since all types of interventions are vulnerable to decay in the absence of continuity (Flay, 2009a, 2009b). In China, Wen et al. (2010) applied a school-based intervention with a randomized controlled trial and found little effect on smoking initiation after one year (7.9% versus 10.6%) and almost no effect after two years (13.5% versus 13.1% for the experimental and control group, respectively).
Car, Cremers, Mercen, Candel, de Vries, 2012; de Josselin de Jong, Candel, Segar, Cremers, & de Vries, 2014; Khalil et al., 2017). In Greece, Kolovelonis, Goudas, Theodorakis et al. (2016) applied a web-based intervention in elementary schools and secondary schools simultaneously (Hellenic Thoracic Society, 2016). Teachers guided the programme, and the analysis resulted in more positive effects in elementary schools than in secondary schools. Cremers and colleagues (2015) implemented a computer-tailored programme designed to prevent children from taking up smoking after transferring to secondary schools, which had no effect on modifying children’s smoking intentions and smoking behaviour in the experimental group compared to the control group. The mixed result of effect findings can be explained by the too young age of the participants (mean age was 10.36). Another web-based trial in the Netherlands aimed at adolescents aged 14–16 years by de Josselin de Jong and colleagues (2014) had significant effects 6 months after the intervention, with only 5.7% smoking initiators among the intervention group and 11.5% among the control group. However, due to a lack of internet access (at the time of the intervention, less than 50% of the population in SA had internet access; Alshahrani, 2016), it could not use the internet approach to deliver the intervention. Nowadays, however, Internet is available almost everywhere in SA, including in schools, and internet users are expected to constitute more than 90% of the population by 2022 (Statista, 2020). Internet use is relatively affordable, making it possible for web-based interventions with electronic devices to be applied. Current study findings could potentially aid the development of web-based tailored interventions, since we were able to specify the relevant smoking behaviour determinants. To do this, collaboration between different bodies (those in charge of tobacco control programmes, school health programmes, internet providers, the Ministry of Communication) is highly recommended. From the above studies and reviews, we conclude that most interventions have the potential to be effective for up to one year in the treatment of some conditions: an interactive approach is used; participants are actively involved in, and not only recipients of, the programme; self-efficacy, enforcement and life skills training activities are included. Furthermore, to have a longer effect, the involvement of families and communities is essential next to the continuity of the intervention. Moreover, other settings can also be used, such as primary health care settings, in which smoking prevention interventions for children and adolescents showed a high impact (Duncan, Pearson, & Maddison, 2018). Other approaches have also shown to be effective and can be adopted, such as...
Chapter 6

Comprehensive smoke-free legislation (Nagelhout et al., 2012) and price policies (Nagelhout et al., 2014), as it is accepted that young adolescents are the most price-sensitive and cigarette taxes continue to be successful in reducing adolescent smoking (Hawkins, Bach, & Baum, 2016).

Challenges encountered

- One of the major challenges was using the active learning approach. This approach was not practiced in schools in SA, where a traditional way of teaching is followed (teachers deliver lectures and then ask questions, and students only listen and answer questions).

- The peer-led approach was also a challenge for the students, as was the practice to choose group leaders by voting.

To overcome these challenges, skills training was required and preceded the intervention as an introductory session. This included a discussion on and training in the principles of teamwork, the benefits of teamwork, skills needed for group work, and leadership.

Methodological issues

Limitations

- With regard to the study population, selecting only boys to be included in the studies was inevitable, since we could not obtain approval to include females. The education administration argues that TS is not officially considered a public health problem for females in SA, and gender-specific education curricula are followed, with different curricula for males and females. Yet, some studies have shown that female Saudi adolescents also smoke significantly: Abdal l a, Al-Kaabba, Saeed, Abdulrahman, and Raat (2007) reported 11.1% smoking prevalence among female adolescents versus 34% among males. Their findings were supported by another study by Kasim, Al-Zalabani, Abd El-Moneim, & Abd El-Moneim (2016), who reported that 26.4% females and 38.9% of male adolescents smoke. However, the reported smoking prevalence among Saudi female adolescents remains much lower than that among...
male adolescents in the published studies and reviews (Alasqah et al., 2019; Al-Asheh et al., 2015; Al-Asheh et al., 2016; Al-Asheh et al., 2018; Al-Asheh et al., 2019; Al-Asheh et al., 2020), which might be due to marks in case anonymity is assured (de Vries, Mudde, Kremers, et al., 2003; de Vries et al., 2006; Dolcini, Adler, & Ginsberg, 1996). Moreover, irregular tobacco use among adolescents occurred more than 24 hours ago and cannot differentiate between low levels of smoking and...
Chapter 6

Strengths

- Different types of studies were used in this thesis: a qualitative study using focus group discussions (Chapter 2), a cross-sectional study (Chapter 3) to assess smoking determinants, a longitudinal study (Chapter 4) to assess predictors and factors associated with smoking initiation, and a randomized case-control study to assess the effect of the school-based smoking prevention programme (Chapter 5). All study types used had consistent findings.

- Randomization: all studies in this thesis followed the randomization approach. Schools were recruited using cluster randomization and randomly assigned to experimental conditions, while students were randomly selected to participate. For the randomized controlled trial, schools were randomly selected for each of the experimental and control groups, and thus selection bias was excluded. Additionally, in the randomized controlled trial, we adjusted the covariates measured at the baseline to make sure they were not related to the outcome (Hernández, Steyerberg, & Habbema, 2004).

- Strong theoretical background: the I-Change Model, which was described in the first chapter of this thesis, was the basis for our intervention. Evidence- and theory-based interventions are more likely to be effective (Michie, Johnston, Francis, Hardeman, & Eccles, 2008). Following the pragmatic methodology used to design our intervention, we used qualitative and quantitative studies to investigate smoking determinants among Saudi adolescents. Additionally, we used a longitudinal study to cross-check for smoking predictors. This approach enhances the effectiveness of the intervention (Cheung et al., 2021).

- We organized training sessions on group work and team-leading skills, in addition to allowing groups to elect their leaders by voting, which was a new experience for students in SA. Life-skills training is known to be associated with long-term effects of smoking prevention programmes (Thomas et al., 2015).

- Following the peer-led group approach and including group discussion in the intervention was among the strengths. This approach, which was new for the target group, made students excited to participate. School-based programmes using a peer-led approach have a potentially higher impact on behaviour change (Mellanby, Rees, & Tripp, 2000), although some reviewers...
General discussion

It is suggested that in the long run, adult-led programmes are more effective than peer-led ones (Thomas et al., 2013a, 2013b). Hence, more research to test the different approaches, also in the context of SA, is needed.

Since there is very few published data about smoking prevention interventions in SA (Abolfotouh, Abdel Aziz, Badawi, & Alakija, 2020; Al Agil & Salih, 2020), and our smoking intervention programme was the first programme in the province, our intervention received the support of schools and education administrations.

Implications for smoking prevention and future research in Saudi Arabia

Our qualitative research in Chapter 2 showed the need for a culturally sensitive programme with religious contents, which proved to be a protective salient belief factor.

Smokers and to a lesser extent non-smokers find it difficult to refuse an offered cigarette; hence, self-efficacy enforcement activities and refusal skills training using different methods, such as role play, arguments, and discussion are essential for any future interventions.

The cross-sectional study in Chapter 3 of this thesis, which assessed determinants of smoking, indicated that adolescent smoking is vulnerable to becoming an epidemic; hence, a tobacco control programme in Saudi Arabia needs to concentrate more on prevention activities. The inclusion of smoking prevention activities in the school curriculum is thus needed.

The longitudinal study of smoking predictors in Chapter 4 demonstrated the strong association between the smoking behaviour of adolescents and social influences constructs. This implies that multi-component interventions are highly recommended, such as a combination of school-based, community, and family activities.

Our intervention programme, which is described in Chapter 5 of this thesis, showed that school-based smoking interventions can be effective in the short term. Future research and studies need to be implemented with long-term efficacy assessments.

Our intervention programme in Chapter 5 of this thesis consisted of five lessons only. In line with recommendations of international studies and reviews (Flay, 2009a, 2009b; Thomas et al., 1997, 2013a, 2013b, 2015), to have a long-term effect, more lessons and the continuation of smoking prevention activities are required for future research.
Nowadays, internet is available almost everywhere in SA, including in schools, and is relatively affordable. This makes it possible for web-based interventions with electronic devices to be applied.

The effects of our intervention might be the result of any of the programme’s components: skills training, role playing, the peer-led approach, social influence factors, and self-efficacy. School interventions in general are effective in reducing smoking onset. Yet, to find out which factor had the largest effect, dismantling studies might be useful. These should estimate the effects of each of these elements individually.

Since there is evidence for increased smoking uptake by female adolescents, more research looking at this group is needed, and the inclusion of female adolescents in future studies and interventions is essential.

Recommendations for tobacco control programmes in Saudi Arabia

Our qualitative study in Chapter 2 and other studies (Almutairi, 2016; El Awa, 2004; Garrusi... have documented the effect of religion on smoking behaviour. Hence, using religious leaders to support smoking prevention activities is highly recommended and can be used as a community prevention component.

Smokers are from high-income families and have extra pocket money. It is well documented that tax increases are among the most effective interventions to reduce tobacco demand (Cheng & Nakhaee, 2012) have documented the effect of religion on smoking behaviour. Hence, using religious leaders to support smoking prevention activities is highly recommended and can be used as a community prevention component.

The ban on selling tobacco products to minors as a policy and activation of the law (Hoffman & Tan, 2017) should be enforced, and collaboration with the Ministry of Trade to achieve this is recommended.

Although the tobacco control programme in SA is functioning well in the cessation aspect of tobacco control, there are fewer efforts made for the prevention aspect. Hence, more support for prevention activities is needed, especially for activities among adolescent communities and school settings.

In conclusion, this study was the first in SA to apply a social cognitive approach to study the determinants of smoking onset and the effects of a smoking prevention approach based on social
Based on a qualitative and quantitative analysis of determinants of intention and behavior among SA boys, derived from theory and previous work, a school-based, peer-led interactive smoking prevention programme was developed. This intervention addressed important attitudinal beliefs (concerning health, public appearance, and religion), normative factors, and self-efficacy beliefs, and involved skill training. Its implementation among 1,381 boys in 19 schools in the province of Tai f was studied using a cluster randomized trial, showing positive effects on attitude, self-efficacy, intention, and behavior. The percentage of smoking initiators in the experimental group was 5.6% lower than that in the control group (3.2% versus 8.8%). Yet, many more steps are needed to successfully prevent smoking onset, as outlined above, not only for boys but also for girls, and not only using school-based programmes but also other interventions such as price policies and policies that lead to smoking becoming a difficult choice to make.
References


Chapter 6


General discussion

---


Evans, R. I., Rozelle, R. M., Mittelmarck, M. B., Hansen, W. B., Bane, A. L., & Havis, J. (1978). Deterring the onset of smoking in children: Knowledge of immediate physiological effects...
Chapter 6

---


---


General discussion


General discussion


Summary

Although many efforts have been made to minimize smoking among all age groups and especially adolescents, it remains the leading cause of preventable death worldwide. In Saudi Arabia, most interventions applied to reduce smoking lack published evaluations. Little is known about the motivational factors that lead adolescents to smoke. Accordingly, school-based smoking prevention programmes with evaluations of their effectiveness are highly needed. This thesis describes the development, implementation, and evaluation of a school-based smoking prevention programme. The overall goal of the project was to prevent smoking initiation among Saudi male adolescents. The thesis has the following objectives:

1. To explore adolescents’ views on smoking and their opinions about a smoking prevention programme (Chapter 2).
2. To investigate whether social cognitive models, such as the I-Change model, can be fruitfully applied in order to understand and change the smoking behaviour of Saudi adolescents (Chapters 3, 4, and 5).
3. To determine demographic differences between smokers and non-smokers (Chapter 3).
4. To assess differences between smokers and non-smokers concerning attitudes, perceived social influences, self-efficacy, and intention towards smoking (Chapters 3 and 4).
5. To study if the resulting programme changes adolescents’ attitudes towards non-smoking in a positive direction and whether the programme is able to strengthen adolescents’ self-efficacy against social pressure, modelling, and norms (Chapter 5).
6. To study the effects of the programme on smoking onset (Chapter 5).

This thesis starts with an overview of smoking prevalence among different age groups in Saudi Arabia in Chapter 1, focusing on adolescents and the history of tobacco in the region. This introductory chapter also addresses different intervention approaches and health promotion theories used to minimize and prevent smoking initiation among adolescents. As recommended by the stepwise approach of the pragmatic methodology chosen, the chapter started with choosing the theoretical model, followed by setting the goal and objectives of the programme, and identifying salient beliefs and determinants of smoking behaviour using the literature. The next steps in the next chapters consisted of conducting qualitative and quantitative research and designing, implementing, and evaluating the programme.
Summary

148

Evaluating the intervention programme. As a theoretical background and rationale that can be used to understand and change the smoking behaviour of Saudi adolescents, we used the integrated model for behaviour change (the I-Change Model). This model originated from the ASE (Attitude-Social influence-Efficacy) model. The first chapter ends with a description of the context and outline of the research project on which this thesis is based.

Chapters 2, 3, and 4 describe the three different types of studies that preceded the intervention: a qualitative, cross-sectional, and longitudinal study aimed at identifying the salient beliefs of smoking behaviour of Saudi adolescents and their preferences for the smoking prevention intervention.

Chapter 2 elaborates on the qualitative study, analyzing 11 focus group discussions, describing the different views of Saudi adolescents, investigating the determinants of their smoking behaviour, and explaining their preferences regarding a smoking prevention intervention. The results revealed that smokers smoke because of the good taste of cigarettes and because they find no alternatives to smoking, believe there is no negative impact on health, and feel like they are not kids when they smoke and look Westernized. Non-smokers do not smoke because of the nasty breath smoking causes, because of the bad effect of smoking on health, and because smoking is against their religious (Islamic) teachings.

To increase insights into factors associated with smoking initiation and continuation, Chapter 3 describes the results of the quantitative study concerning the determinants of smoking. This chapter outlines the factors related to smoking behaviour among adolescents and assesses the need for an anti-smoking intervention programme. The cross-sectional study included 695 respondents from the seventh to the ninth grade, in which adolescents from affluent families with more daily pocket money and lower academic performance were more susceptible to smoking. Non-smokers had a negative attitude towards smoking, lower perceived social influences encouraging smoking, a higher perceived self-efficacy in resisting pressure to smoke, and a lower intention to smoke than smokers. The chapter also discusses whether the I-Change Model is suitable for understanding TS behaviour in Saudi Arabia.

Since the cross-sectional study can increase insights into factors associated with smoking initiation and continuation but not the process of smoking initiation, Chapter 4 discusses and shows the results of the longitudinal study, which assessed the smoking predictors. In this study, we recruited...
Summary

The non-smokers from the control group at wave 1 to the randomized controlled trial and compared smoking initiators with those who did not pick up smoking after six months (wave 2). We used T-tests to assess the mean differences between smokers and non-smokers and logistic regression analyses to discover the predictors for smoking onset among Saudi adolescents. The findings of this chapter support the findings of the preceding chapter, in which smoking initiators were those with a relatively high monthly income, of low academic achievement, and living in disrupted families. Smokers have a high perceived pressure to smoke coming from parents and teachers, with smoking-supportive norms of parents, and have a high intention to smoke in the future.

Chapter 5 outlines the development, implementation, and evaluation of the anti-smoking intervention programme, in which a randomized control study, with 10 schools randomly selected for the experimental group and nine schools for the control group, was conducted. Our intervention consisted of five lessons and used different behaviour change techniques, as recommended by the taxonomy of the intervention mapping. Six months after implementation, we found that smoking initiation was 3.2% in the experimental group and 8.8% in the control group ($p < 0.01$), with a significantly more negative attitude towards smoking, stronger social norms against smoking, a higher self-efficacy regarding non-smoking, more action planning to remain a non-smoker, and lower intentions to smoke in the future among the experimental group.

Chapter 6 is the concluding chapter of the thesis, which discusses the main findings of the various studies on smoking prevention for Saudi adolescents, summarizes the methodological strengths and limitations of the entire thesis, and addresses implications for future research and the practice of smoking prevention programmes. This chapter also discusses what could be improved, other approaches that could be used, and recommendations for tobacco control programmes in SA.

It is worth mentioning that the questionnaires used in this thesis were based on the European Smoking Prevention Framework Approach (ESFA), which was previously used to assess and influence smoking behaviour among adolescents in many European countries and recently in Jordan. In all these studies, the ESFA questionnaire was reported as being reliable and valid for assessing smoking behaviour among adolescents. For the purpose of the current thesis, the questionnaire was translated into Arabic, with some minor adaptations to make it suitable for Saudi norms.

Finally, the studies in this thesis included only boys, because the educational system in SA is gender-specific, smoking is officially not considered a problem for school girls, and funding was...
Summary

150 not available to develop an approach targeting girls. Hence, more research targeting both male and female adolescents is needed to explore a more refined set of proximal and distal factors related to smoking behavior, with a short- and long-term effect assessment.
Samenvatting

Het roken van tabak is een van de grootste mondiale volksgezondheidsproblemen. Hoewel er veel inspanningen zijn gedaan om roken onder alle leeftijdsgroepen en vooral onder adolescenten te dringen, blijft roken wereldwijd de belangrijkste oorzaak van preventie. In Saoedi-Arabië ontbraken gepubliceerde evaluaties van de meeste interventies die worden toegepast om het roken te dringen. Er is weinig bekend over de motiverende factoren die roken bij adolescenten aantrekkelijk maken. Daarom is er grote behoefte aan schoolgebaseerde rookpreventieprogramma's met evaluaties van hun effectiviteit. Deze disseratie beschrijft de ontwikkeling, implementatie en evaluatie van een schoolgebaseerde rookpreventieprogramma. Het algemene doel van het project was het voorkomen van beginnen met roken onder Saoedische mannelijke adolescenten. Het proefscript heeft de volgende doelstellingen:

- Het onderzoeken van de opvattingen van adolescenten over roken en hun mening over preventieprogramma's voor roken (Hoofdstuk 2).
- Onderzoeken of sociaal cognitieve modellen, zoals het I-Change-model, vruchtbaar kunnen worden toegepast om het rookgedrag van Saoedische adolescenten te begrijpen en te veranderen (Hoofdstuk 3, 4 en 5).
- Het bepalen van demografische verschillen tussen rokers en niet-rovers (Hoofdstuk 3).
- Het vaststellen van verschillen tussen rokers en niet-rovers met betrekking tot attitude, waargenomen sociale invloeden, zelf-efficacy en intendie en interesse van roken (Hoofdstuk 3 en 4).
- Nagaan of het resulterende programma de houding van adolescenten ten opzichte van niet-roken in positieve zin veranderd of het programma in staat is om de zelf-efficacy van adolescenten op de sociale druk, model-ling en normen te versterken (Hoofdstuk 5).
- Het beseffen van de effecten van het programma op beginnen met roken (Hoofdstuk 5).

Deze disseratie begint met een overzicht van de prevalente van roken onder verschillende leeftijdsgroepen in Saudi-Arabië in Hoofdstuk 1, met nadruk op adolescenten en de geschiedenis van tabak in de regio. Dit initiële hoofdstuk behandelt ook de verschillende interventiebenaderingen en gezondheidsbevorderende theorieën die gebruikt worden om het beginnen met roken onder adolescenten te minimaliseren en te verhinderen. Zoals aanbevolen in de stapsgewijze aanpak van de gekozen pragmatistische methodologie, begint het hoofdstuk met het theoretisch model, gevolgd door het vaststellen van het doel en de doelstellingen van het programma, en het identificeren van centrale overtuigingen en determinanten van rookgedrag met behulp van de
Samenvatting

De volgende stappen in de volgende hoofdstukken bestonden uit het uitvoeren van kwalitatief en kwantitatief onderzoek en het ontwerpen, implementeren en evalueren van het interventieprogramma. Als theoretische grond en rationele die kan worden gebruikt om het gedrag van Saoedische adolescenten te begrijpen en te veranderen, gebruikt en we het geïntegreerde model voor gedragsverandering (het I-Change Model). Dit model is voortgekomen uit het ASE-model (Attitude-Social Influence-Efficacy).

Hoofdstuk 2 gaat dieper in op het kwalitatieve onderzoek, waarbij 11 focus groepdiscussies worden geanalyseerd, de verschillende opvattingen van Saoedische adolescenten worden beschreven, de determinanten van hun rookgedrag worden onderzocht, en hun voorkeur en aanziens van een rookpreventie interventie worden aangestuurd. Uit de resultaten blijkt dat rookers rook vanwege de leukere smaak van sigaretten en omdat ze geen alternatief voor roken vinden, geloven dat er geen negatieve gevolgen voor het gezondheid zijn, en het gevoel hebben geen kind te zijn als ze roken en er westers uit zien. Niet-rookers roken niet vanwege de vieze adem die rokers veroorzaakt, vanwege het slechte effect van roken op gezondheid, en omdat roken tegen hun religieuze (islamitische) leer is.

Om meer inzicht te krijgen in de factoren die samenhangen met beginnen en doorgaan met roken, zien we in hoofdstuk 3 de resultaten beschrijven van het kwantitatieve onderzoek naar de determinanten van roken. Dit hoofdstuk schetst de factoren die samenhangen met rookgedrag onder adolescenten en beoordeelt de behoefte aan een interventieprogramma tegen roken. Het crossesectionele onderzoek omvat 695 respondenten uit de zevende tot en met de negende klasse, waarbij adolescenten uit welgestelde gezinnen met meer dagelijks zakgoed en lagere schoolprestaties vatbaarder blijken voor roken. Niet-rookers hadden een negatieve houding en opziend van roken, een lagere waarneembare sociale invloed die roken aanmoedigt, een hogere waarneembare zelf-efficacy in het weerstaan van druk om te roken, en een lagere intentie om te roken dan rookers. Het hoofdstuk bespreekt ook of het I-Change Model geschikt is voor het begrijpen van rookgedrag in Saoedische...
Samenvatting

Omdat de cross-sectionele studie meer inzicht kan geven in factoren die samenhangen met beginnen en doorgaan met roken, maar niet in het proces van beginnen met roken, worden in hoofdstuk 4 de resultaten van de longitudinale studie, waarin de factoren die roken voorstellen zijn onderzocht, besproken en weer gegeven. In deze studie hebben we de niet-rokers uit de controlegroep bij rond 1 gerekterd voor de gerandomiseerde gecontroleerde trial en hebben we in rond 2 beginnende rokers vergeleken met degenen die na zes maanden niet waren begonnen met roken. We gebruikten T-tests om de verschillen tussen rokers en niet-rokers vast te stellen en logistische regressieanalyses om de voor spellers voor beginnende rokers onder Saoedische adolescenten te halen. De resultaten van dit hoofdstuk ondersteunen de bevindingen uit de voorgaande hoofdstukken, waarin de beginnende rokers degenen waren met een relatief hoog maandinkomen, met lagere schoolprestaties, en wonend in onvruchtige gezinnen. Rokers hebben een hogere gewenste druk om te roken, afkomstig van ouders en leraren, met ouderlijke normen die roken ondersteunen, en hebben een hoge interesse om in de toekomst te roken.

Hoofdstuk 5 schetst de ontwikkeling, implementatie en evaluatie van het anti-rook interventieprogramma, waarbij een gerandomiseerde gecontroleerde studie is uitgevoerd. Tiend scholen zijn willekeurig geëxprimeerd voor de experimentele groep en negen scholen voor de controlegroep. Onze interventie bestond uit vijf lessen en maakte gebruik van verschillende gedragsveranderingstechnieken, zoals aanbevolen door de taxonomie van Intervention Mapping. Zes maanden na de implementatie vonden we dat het aantal beginnende rokers 3,2% was in de experimentele groep en 8,8% in de controlegroep ($p < 0,01$), met een significant negatieve houding ten opzichte van roken, sterke sociale normen tegen roken, een hogere zelf-efficacy met betrekking tot niet-roken, meer actieplanning om een niet-roker te blijven, en lagere intensies om in de toekomst te roken bij deelnemers in de experimentele groep.

Hoofdstuk 6 is het afsluitende hoofdstuk van het proefschrift, waarin de belangrijkste bevindingen van de verschillende onderzoeken naar rookpreventie onder Saoedische jongeren worden besproken, de methodologische sterke punten en beperkingen van het gehele proefschrift worden samengevat, en implicaties voor toekomstig onderzoek en de praktijk van preventieprogramma's voor roken aan de
Samenvatting

De komende hoofdstuk bespreekt ook wat er verbeterd zou kunnen worden in onze interventie, andere benaderingen die gebruikt zouden kunnen worden, en aanbevelingen voor tabaksontmoedigingsprogramma's in Saoedi-Arabië.

Vermeldenswaard is dat de vragenlijst die in dit proefscript zijn gebruikt, gebaseerd zijn op de European Smoking Prevention Framework Approach (ESFA), die eerder in veel Europese landen en recentelijk in Jordanie is gebruikt om gedrag onder adolescenten te beoordelen en te beïnvloeden. In alle onderzoeken werd de ESFA-vragenlijst betrouwbaar en valide bevonden voor het beoordelen van gedrag onder adolescenten. Voor het doel van dit proefscript werd de vragenlijst vertaald in het Arabisch, met enkele kleine aanpassingen om hem bruikbaar te maken gegeven Saoedische normen.

Tot slot, in deze disseratie werden alleen jongens onderzocht, omdat het onderwiessysteem in Saoedi-Arabië gender-specifiek is, roken ofwel niet als een probleem voor schoolmeiden wordt beschouwd, en er geen financiële middelen beschikbaar waren om een aanpak voor meiden te ontwikkelen. Meer onderzoek gericht op zowel mannelijke als vrouwelijke adolescenten is dus nodig om een meer verfijnde set van proximale en distale factoren gerelateerd aan gedrag onderzoeken, met een korte- en lange-termijn effect beoordeling van interventies.
Impact of the research

School-based smoking prevention intervention for Saudi adolescents

Findings of studies included in the thesis
Impact

The nasty breath smoking causes, because of the bad effect of smoking on health, and because smoking is against their religious (Islamic) teachings. Certain factors affect smoking behaviour based on the research: the perceived influence of people around adolescents as models, acceptance of their smoking behaviour by their surroundings, the pressure they feel to smoke coming from their environment, and low self-efficacy in certain situations such as being called a coward or a chicken if they do not smoke.

For the intervention, participants preferred a preventive programme facilitated by school health care workers during school hours within the school premises, using an interactive approach which they are a part of instead of being only listeners, working in groups led by participants they select, and using role play.

The results of the second study, which was a cross-sectional quantitative study, confirmed the findings of the first study and identified additional determinants. Adolescents from affluent families, with more daily pocket money and lower academic performance, were more susceptible to smoking than their peers who had little or no pocket money, were from needy families, and had higher academic attainment.

Based on the two studies, a school-based intervention programme was designed, which consisted of five lessons with two to three activities each. Nine schools were randomly chosen to receive the intervention as an experimental group, and 10 schools were chosen to receive the regular curriculum as the control group. As adolescents in SA were not accustomed to working in groups and interactive learning, we had to train them in group work, the skills needed for leading the group, and how to choose the group leader. Adolescents voted to choose their groups’ leaders. Each lesson of the intervention addressed one to three smoking determinants, demonstrated by a live or video-recorded role play performed by adolescents. Then discussion followed, an overview was made by the group leader, and feedback was presented to all groups.

The third study was a longitudinal one and intended to detect the predictors of smoking. We followed those in the control group who were not smokers and had become smokers by the end of the study. The results showed that predictors of smoking were relatively high monthly income, low academic achievement, broken homes, perceived high pressure to smoke from parents and teachers, smoking norms of parents, and a high intention to smoke in the future.
Impact

After the intervention, we conducted the fourth study, in which we assessed the effect of our intervention programme on smoking behaviour and its determinants. The results showed that 8.8% of the control group had started to smoke, while in the intervention group, only 3.2% of participants had begun to smoke. Participants in the latter group felt more negatively about smoking and had stronger social norms against smoking, higher self-efficacy regarding non-smoking, more active plans to remain non-smokers, and lower intentions to smoke in the future.

Our intervention was the first prevention programme in the area, the first to use an interactive learning approach, and the first to train adolescents in group work, team leadership, the selection of group leaders by voting, smoking refusal skills, and how to cope with social pressure.

Participants were part of the intervention and given the chance to evaluate the programme’s approach, content, and providers.

As our intervention was the first prevention intervention in SA, it contributed to the literature in the field of smoking prevention and tobacco control in SA by identifying the determinants of smoking behaviour among adolescents. Additionally, our intervention and research included in this thesis proved that health promotion models and behaviour change theories designed and implemented in Western countries, for example, the Integrated-Change Model (I-Change Model), are also applicable and valid and could be effective in understanding and changing smoking behaviour in Arab countries.

Impact on school health programmes, tobacco control programmes, and future research

Our qualitative research in Chapter 2 showed the need for a culturally sensitive programme with religious content, supporting findings of other studies in the region, which documented the effect of religion on smoking behaviour. Hence, using religious leaders to support smoking prevention activities is recommended and can be one of the community prevention strategies.
Impact

The cross-sectional study in Chapter 3 of the thesis assessed the determinants of smoking. It indicated that adolescent smoking is vulnerable to becoming epidemic. Although the tobacco control programme in SA is functioning regarding the cessation aspect of tobacco control, there are fewer efforts made for the prevention aspect. Hence, more support for prevention activities and the inclusion of smoking prevention activities in the school curriculum, training teachers in health education and students in peer education, are needed. This is especially required for adolescents in communities and school settings, and tobacco control and prevention programmes should continuously evolve.

The study also showed that smokers and, to a certain extent, non-smokers find it difficult to refuse -efficacy enforcement activities and refusal skills training using different methods such as role play, arguments, and discussion are essential for any future interventions.

The qualitative and quantitative studies in this thesis in Chapters 2, 3, and 4 revealed that smokers come from high-income families and have extra pocket money. Since it is well documented that tax increases are among the most effective interventions to reduce tobacco demand, increasing the prices of and taxes on tobacco in SA is highly recommended. Also, the enforcement of the ban on selling tobacco products to minors as a policy and activation of the law, in addition to strengthening coordination and collaboration with concerned bodies (Ministry of Health, Ministry of Education, Ministry of Interior, and Ministry of Trade) to achieve this, is recommended.

Our intervention programme, which is described in Chapter 5 of the thesis, showed that school-based smoking interventions can be effective in the short term. Future research and studies need to be conducted using long-term efficacy assessments.

The longitudinal study of smoking predictors in Chapter 4 demonstrated the strong association between the smoking behaviour of adolescents and social influences constructs. This implies that multi-component interventions are highly recommended, such as a combination of school-based, community, and family activities.

The effects of our intervention might be due to any of the programme's components: skills training, role playing, the peer-led approach, social influence factors, and self-efficacy. School interventions in general are effective in reducing smoking onset. Yet, to find out which factor has the largest impact.
Impact

Disruptive studies might be useful. These should estimate effects of each of these elements individually.

Due to logistics and administrative regulations, we could not include females in our studies (although attempts were made). Since there is evidence of increased smoking uptake by female adolescents, more research to investigate this group is needed as well as the inclusion of female adolescents in future studies, to learn whether there are gender-specific determinants for smoking behaviour and to design and implement the required interventions accordingly.

At the time of the research, there was limited internet availability. Therefore, our intervention was not web-based. However, nowadays, internet accessibility is over 95% in SA, including in schools, and is relatively affordable. This makes it possible to apply web-based interventions with electronic devices. To disseminate the prevention intervention, it is highly recommended for tobacco programmes and school health programmes to use web-based interventions.

Based on the preferences of the target group in our studies, the intervention was limited to adolescent students and took place within schools. However, community involvement is essential for any future research and effective intervention, and this can be gained by involving anti-tobacco non-governmental organisations, community leaders, families, and parents. In addition, to help disseminate smoking prevention activities, special attention should be paid to outreach and remote areas.

Further more, it is necessary for the tobacco control programme to consider working on the enforcement of policies and regulations related to tobacco trading in coordination with relevant bodies in order to increase taxation on tobacco products, enforce the law that bans selling tobacco to minors, create a smoke-free policy, and ban smoking in public places.
Propositions

- Having smoking friends and family members who smoke is one of the driving factors for adolescents to start smoking. Hence, identifying them as a target group for smoking prevention intervention is crucial.

- Low self-efficacy of adolescents to resist an offered cigarette increases the likelihood of smoking initiation. Enforcement of adolescent self-efficacy against pressure is essential for any successful smoking prevention intervention.

- Effective school-based smoking prevention interventions in Saudi Arabia require tailoring to culture-specific beliefs and acceptable strategies such as involvement of religious leaders.

- Using socio-cognitive models to prevent smoking initiation in Saudi Arabia requires a deep analysis of smoking behavior determinants.

- Digital health needs to be implemented as an addition to traditional school-based programs in Saudi Arabia.

- Prevention is more cost-effective than curing, but receives too little attention in Arab cultures. More attention is needed for the prevention role in smoking interventions in the Arab world.

- Tobacco use by women in Saudi Arabia is rising; hence, gender-specific targeting is needed in intervention design.

- Health promotion and health education theories are also applicable in non-Western cultures to understand and change smoking behaviors, utilizing those theories in the Arab world will be valuable.

- “It is health that is real wealth and not pieces of gold and silver”.

- “No slave of God shall move on the Day of Judgment until he is asked about his life and how he spent it, his knowledge and what he did with it, his wealth and whence he obtained it and how he spent it, and his body and how he used it”.

- "It is health that is real wealth and not pieces of gold and silver".
Acknowledgements

I would like to express my deepest gratitude to my supervisors Professor Hein de Vries, Professor Nanne de Vries, and Doctor Kelvin Cheung. I cannot have sufficient words to thank you for your wide knowledge, dedicated and strong support, instant feedback, patience, and friendliness. Despite their tight schedule, they always used to make time to discuss problems and offer valuable advice and recommendations. Their understanding and logical way of thinking have been of great value to me, gave me confidence to work independently and to think critically. Their continuous support and guidance encouraged me to complete this thesis in the way it is. I will never forget the support of Doctor Eggers Matthias, thank you Matthias.

I wish to express my sincere appreciation to the staff of the Health Promotion and Health Education Department, Faculty of Health, Medicine and Life Sciences, University of Maastricht, for their support, warm hospitality, and services provided.

I am grateful to all the headmasters of schools who participated in the studies from all over Tai Prowince, and special thanks to my colleagues at the school health programme in Tai Prowince.

My family was always with me at home and abroad throughout this study. My wife, daughter, and son are the source of inspiration and the reason for success in my life. Thank you for your care and support that enabled me to continue and complete this thesis.
Curriculum vitae

Mutaz Mohammed was born in 1970 in Arbjai, Sudan. He got a Bachelor of Medicine and Surgery from the Faculty of Medicine, University of Khartoum, in 1998. In 2001, he obtained his master degree in public health (MPH) from the Faculty of Health, Medicine and Life Sciences, Maastricht University. Additionally, in 2004, he completed the fellowship of community medicine from Sudan Medical Specialization, he moved from Sudan to Saudi Arabia to work in Taif province for the school health programme as a department head of preventive medicine, where he started his project. In 2018 he got his second fellowship in community medicine from The Arab Board for Specialization in Medicine. Mutaz Mohammed is working now as a consultant of preventive medicine and public health for the Agency of Public Health, Ministry of Health - Saudi Arabia.
Publications from this thesis


List of publications

Other publications


List of publications


List of publications

- Secular trend and epidemiology of measles in the Kingdom of Saudi Arabia: 2009-2012. *Travel Medicine and Infectious Disease*, 13(1), 74–79. [https://doi.org/10.1016/j.tmaid.2014.11.009](https://doi.org/10.1016/j.tmaid.2014.11.009)

- Surveillance and testing for Middle East Respiratory Syndrome Coronavirus, Saudi Arabia, April 2015-February 2016. * Emerging Infectious Diseases*, 23(4), 682–685. [https://doi.org/10.3201/eid2304.161793](https://doi.org/10.3201/eid2304.161793)