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The Impact of a Pharmacist-Conducted Interactive Anti-Smoking Education Program on the Attitudes and Knowledge of High School Students*

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Introduction: Smoking among adolescents remains a major concern because of its long term health hazards. An effective adolescent-specific anti-smoking education is needed. *Objectives*: To measure the impact of a school-based tobacco prevention program provided by pharmacists on the attitudes and knowledge of senior high students. *Methods*: An anti-smoking program specifically aimed at high school students was developed by pharmacists and introduced to 354 students in Taiwan. It consisted of a role play and a lecture. The students were asked to complete a structural questionnaire right before and after the intervention. *Results*: After the intervention, the average of the total attitude scores increased from 41.7 to 43.2 ($p = 0.001$), and the total knowledge scores increased from 6.4 to 8.2 ($p < 0.001$). The average practice score was 31.2 (maximum score = 50) and the result suggested that the practice score was associated with attitude rather than knowledge. *Conclusion*: This pharmacist-conducted anti-smoking program for high school students resulted in positive changes regarding both attitude and knowledge. This suggests that further anti-smoking programs targeting students would be effective in helping to prevent youth smoking.

Keywords: Attitude; High School; Smoking Cessation; Questionnaire; Education

Introduction

Adolescent smoking has a huge impact on global health and imposes a burden on the economy ("Curbing the epidemic: governments and the economics of tobacco control. The World Bank", 1999; Preventing tobacco use among young people. A report of the Surgeon General. Executive summary", 1994). The smoking rate among adults in Taiwan has declined, while in contrast the smoking rate among young people has risen (*Taiwan Tobacco Control* 2009 *Annual Report*, 2009). Studies indicated that many students had their first experience of smoking in the 5th and 6th grade of elementary school (Escobedo, Anda, Smith, Remington, & Mast, 1990; Minagawa, et al., 1992). In Taiwan, 23.2% of ever-smoking high school students started smoking before reaching the age of 10 (*Taiwan Tobacco Control* 2009 *Annual Report*, 2009). The earlier a youth begins using tobacco, the more likely it is that they will continue the habit into adulthood and that it will influence their entire life (Jackson & Dickinson, 2004; Khuder, Dayal, & Mutgi, 1999). Tobacco is classified as "Gateway" drug and research has shown that teens between 13 and 17 years of age who smoke daily are more likely to use other drugs/substances, including alcohol, marijuana and cocaine (*Summary of Findings from the* 1998 *National Household Survey on Drug Abuse*, 1999; Takakura & Wake, 2003). Smoking harms nearly every organ of the body, causing both short-term and long-term effects (Fagerstrom, 2002). It accounted for an estimated 443,000 deaths, or nearly 1 of every 5 deaths annually in the United States, and more than 18,800 deaths a year in Taiwan. In this context it can be seen that reducing the adolescent smoking rate is a paramount task in nourishing the younger generation (Lynch & Bonnie, 1994).

Understanding the mentality which leads to adolescent smoking is essential in order to design an effective anti-smoking program and escape its harmful consequences. Studies have demonstrated that peer effects, curiosity, anxiety and a feeling of maturity are important determinants of smoking (Ali & Dwyer, 2009; Wang, Fitzhugh, Westerfield, & Eddy, 1995). The 2009 Youth Tobacco Use Survey in Taiwan also showed similar results (*Taiwan Tobacco Control* 2009 *Annual Report*, 2009). It revealed that 41.2% of senior and vocational high school students had smoked. This figure included 10% who reported being motivated by peer pressure and 10.8% who said they used tobacco for stress relief. Almost half (47%) of teen smokers first acquired cigarettes from their classmates or friends (*Taiwan Tobacco Control* 2009 *Annual Report*, 2009). This indi-

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cates the accessibility of cigarettes through companionship and underscores the importance of preventing smoking on campus. An effective adolescent-specific anti-smoking education needs to provide a fundamental resolution to prevent smoking in adolescents.

Smoking is the leading preventable cause of death, and health is the most commonly stated primary and overall reason for wanting to quit (Aung, Hickman, & Moolchan, 2003). As well-trained health care professionals, pharmacists can be persuasive in educating teens about the long-term effects of smoking. The current program, with its attempt to create more interactive and effective questioning, discussion and learning, was designed to measure the impact of a school-based tobacco prevention program provided by pharmacists on the attitudes and knowledge of senior high students.

Materials and Methods

The anti-smoking education program conducted by pharmacists from Taipei Medical University Wan-Fang Hospital was implemented in four senior high schools (Wan-Fang, Zhong-Lung, Lih-Ren, and Blessed Imelda's senior high school) in one of their military training classes from Sep. 2005 to Nov. 2005. All students participated in these classes were included into the study. The program was composed of two educational models: a drama and a lecture. The drama with role-playing scenes was used to prepare students for social situations and centered on how to resist peer pressure and to practice straightforward and simple refusal skills. The lecture contained 3 main aspects: (1) the physical effects and disadvantages of smoking, (2) the importance of smoking cessation, and (3) ways to cope with stress (**Table 1**). The disadvantages focused on were risks that might most concern young people: the staining of teeth and nails, premature aging, and smoker's breath. However, other important smoking-related health issues like chronic lung disease, cardiovascular diseases and cancers were also addressed. The participants were asked to provide their demographic information and complete the questionnaires before and after the program. The total scores of the responses to the knowledge and attitude questions were analyzed to evaluate the efficacy of the program.

Table 1.
Program materials and the schedule.

Materials	Outline
Script for Role play	Peer-pressure scenario: how to resist peer-pressure and practice refusal skills.
PowerPoint presentation lectured by the pharmacists	1. Tobacco related illness - Tar, nicotine, carbon monoxide and carcinogens. - Physical effects concern teenagers. - Chronic diseases. 2. Benefit of smoking cessation - Lowers the risk for cancer, coronary heart disease, stroke, and peripheral vascular disease. - Reduces respiratory symptoms and the risk for infertility. 3. Ways to cope with stress - Exercises, hobbies, and family/friend supports.

Schedule of the anti-smoking education program

1. September 28th, 2005: Wan-Fang senior high school
2. October 5th, 2005: Zhong-Lung senior high school
3. October 17th, 2005: Lih-Ren senior high school
4. November 14th, 2005: Blessed Imelda's senior high school

Questionnaire Development

The surveillance questionnaire was developed and modified from previously published literature (Hsia & Spruijt-Metz, 2003; Meier, 1991). The pre- and post-intervention questionnaires differed only in the practice section, which was exclusive to the pre-intervention test. The contents were validated by three experts who majored in nursing, clinical pharmacy, and public health. The test-retest was given to 40 senior high school students to check reliability, which resulted in Spearman's rho coefficients of 0.709, 0.805, and 0.715 for attitude, practice, and knowledge respectively. The internal consistency values, using Cronbach Alpha, were 0.558, 0.815 and 0.546 for knowledge, attitude and practice items.

Knowledge Test. The knowledge questionnaire contained 10 questions to test the students' general knowledge of tobacco, common myths surrounding smoking, and the health consequences of smoking (**Table 2**). Each item had 3 alternatives: true, false and unknown. Scores were calculated as the sum of correct answers, with 10 being the highest possible score.

Attitude Measures. The attitude questionnaire comprised of 10 questions with responses given on a five-point scale to measure attitudes towards personal, social and environmental aspects of tobacco use (**Table 2**). The highest possible score was 50 and the lowest was 10. Higher scores represented a more positive attitude about avoiding cigarette smoking.

Practice Evaluation. The 10 items in this evaluation were related to the behavior of the students over the previous six months (**Table 3**). Each item was scored on a five-point scale, with the lowest possible score being 10 and the highest 50. Higher scores represented better practice in supporting anti-smoking activities.

Statistical Analyses

Spearman's correlation was used to identify test and re-test reliability as well as the correlations regarding the attitude, practice and knowledge scores. The Wilcoxon signed-rank test was used to analyze the differences in the correct rates of knowledge and attitude. All statistical tests were computed using the *Statistical Package for Social Science* (SPSS 13.0, SPSS Inc, Chicago, IL, USA) with significance defined as $p < 0.05$. Because the questionnaires were anonymous, two-sample t-tests were used instead of paired t-tests.

Results

A total of 354 students participated in the education program, and 304 (86%) students completed and returned both the pre-intervention and post-intervention questionnaires. The demographic data of the students can be seen in **Table 4**. Female students were predominant, 208 (68.4%), due to the fact that the Blessed Imelda Senior High School is a girls' high school. Comparing to male students, female students had higher total attitude scores (40.1 ± 6.39 vs. 42.5 ± 5.8, $P = 0.002$) and total practice scores (29.45 ± 4.4 vs. 32.03 ± 3.89, $P < 0.001$). There were no significant differences in total knowledge scores between males and females (6.51 ± 2.15 vs. 6.3 ± 1.86, $P = 0.238$).

More than half the participants (184 students, 60.5%) had family members with smoking habits, 37 (12.2%) had some experience of smoking, and 4 (1.3%) were regular smokers (**Table 4**). Before the intervention, the total knowledge and attitude

Table 2.
Knowledge and attitude scores: impact of the intervention.

Categories	Items	Pre-intervention	Post-intervention	P-value
Knowledge				
Common myth of smoking	3	2.17 ± 0.71	2.78 ± 0.62	<0.001
Smoking with a filter can minimize health damages		0.79 ± 0.40	0.96 ± 0.20	<0.001
Inhaling second-hand smoke does no harm to our health		0.97 ± 0.16	0.92 ± 0.26	0.005
Light or mint cigarettes do less harm to our bodies than general ones do		0.41 ± 0.49	0.89 ± 0.31	<0.001
General knowledge of tobacco	2	0.68 ± 0.73	1.02 ± 0.75	<0.001
There is cholesterol in cigarettes		0.27 ± 0.44	0.47 ± 0.50	<0.001
Tar is the main substrate that causes tobacco addiction		0.41 ± 0.49	0.55 ± 0.50	<0.001
Health consequences	5	3.52 ± 1.36	4.43 ± 0.97	<0.001
Oral cavity cancer is unrelated to smoking		0.79 ± 0.41	0.94 ± 0.24	<0.001
Gastrointestinal ulcers are unrelated to smoking		0.68 ± 0.47	0.89 ± 0.31	<0.001
Smoking will affect efficacy of some medications (e.g. contraceptives)		0.61 ± 0.49	0.77 ± 0.42	<0.001
Smoking will interfere with the menstrual cycle		0.68 ± 0.47	0.91 ± 0.29	<0.001
Pregnant women who smoke will easily give birth to underweight babies		0.76 ± 0.43	0.93 ± 0.26	<0.001
Total	10	6.37 ± 1.95	8.24 ± 1.63	<0.001
Attitude				
Personal aspect	3	8.73 ± 2.62	9.35 ± 2.76	0.002
1. Smoking can keep up one's spirits		2.81 ± 1.10	2.98 ± 1.19	0.048
2. Smoking can make one feel relaxed		2.75 ± 1.12	3.01 ± 1.20	0.002
3. Smoking is a tool to control body weight		3.18 ± 0.98	3.37 ± 0.96	0.019
Social aspect	4	14.11 ± 2.37	14.56 ± 2.17	0.005
4. People can make friends through smoking		3.45 ± 0.80	3.63 ± 0.67	0.002
5. Smoking is a symbol of maturity		3.53 ± 0.76	3.67 ± 0.68	0.009
6. Smoking can make me look cool		3.40 ± 0.86	3.70 ± 0.62	<0.001
7. Smoking may affect others' health		3.72 ± 0.74	3.57 ± 1.03	0.04
Environmental aspect	3	8.88 ± 2.51	9.27 ± 2.91	0.029
8. Smoking should be forbidden in all internet café and KTV		3.07 ± 1.11	3.11 ± 1.26	0.559
9. Cigarette smells make people uncomfortable		3.34 ± 1.16	3.42 ± 1.12	0.412
10. Advertisements of tobacco should be forbidden		2.46 ± 1.23	2.73 ± 1.25	0.004
Total	10	31.71 ± 6.06	33.18 ± 5.83	0.001

(1) Knowledge scores were calculated as the sum of correct answers, with 10 being the highest possible score; (2) Five point scale for attitude #7, 8, 9, 10: 5 = strongly agree, 4 = agree, 3 = neither agree nor disagree (neutral response), 2 = disagree, 1 = strongly disagree; (3) Five point scale for attitude #1, 2, 3, 4, 5, 6: 5 = strongly disagree, 4 = disagree, 3 = neither agree nor disagree (neutral response), 2 = agree, 1 = strongly agree; (4) Higher attitude scores represented a more positive attitude about avoiding cigarette smoking.

Table 3.
Practice: pre-intervention scores.

Categories	Items	Pre-intervention
Personal aspect	3	4.88 ± 1.47
1. I reported stores selling tobacco to teenagers		0.18 ± 0.54
2. I bought cigarettes for my family, friends or myself		3.68 ± 0.73
3. I joined educational anti-smoking campaigns		1.01 ± 1.03
Social aspect	4	11.03 ± 2.48
4. I dissuaded my family and relatives from smoking		1.79 ± 1.39
5. I dissuaded my classmates or friends who are nonage from smoking		1.55 ± 1.33
6. My relatives or friends have asked me to smoke		3.84 ± 0.47
7. I said yes when other people asked me to smoke		3.84 ± 0.58
Environmental aspect	3	5.29 ± 1.87
8. I dissuaded strangers from smoking in the non-smoking area		0.37 ± 0.67
9. I prefer to go to smoke-free public places		2.24 ± 1.22
10. I have been to places where a lot of people smoke (e.g. Karaoke, pub etc.)		2.69 ± 1.02
Total	10	21.2 ± 4.23

(1) Five point scale for #2,6,7,10: 1 = always, 2 = usually, 3 = sometimes, 4 = seldom, 5 = never; (2) Five point scale for #1, 3, 4, 5, 8, 9: 1 = never, 2 = seldom, 3 = sometimes, 4 = usually, 5 = always; (3) Higher scores represented better practice in supporting anti-smoking activities.

Table 4.
Demographic data of enrolled students.

Demographic characters	Number (%)
Grade	
11th	220 (72.3)
12th	84 (27.6)
Gender	
Male	96 (31.5)
Female	208 (68.4)
Do any members of your family smoke?	
Yes	184 (60.5)
No	120 (39.4)
Have you ever smoked?	
Yes, and I have smoking habit.	4 (1.3)
Yes, but I don't have a smoking habit.	37 (12.2)
No.	263 (86.5)

scores between groups of students with and without family smokers had no significant difference (both $P > 0.05$). However, the practice scores of students with family smokers were significantly higher in social aspect (15.45 ± 8.0 vs. 14.76 ± 2.5, $P < 0.012$) but lower (7.9 ± 2.0 vs. 8.5 ± 1.8, $P < 0.004$) in environmental aspect compared to students without family smokers (**Table 5**).

The education program improved the students' knowledge of issues surrounding smoking remarkably, with the average total score increasing from 6.37 ± 1.95 to 8.24 ± 1.63 (maximum score = 10, $p < 0.001$) (**Table 2**). In the post-intervention questionnaire, question #4 (There is cholesterol in cigarettes) had the lowest percentage of correct answers (47.97%) and question #1 (Smoking with a filter can minimize health damages) had the highest (96.96%).

The mean post-intervention attitude score was 1.47 points higher than that of the pre-intervention, the scores being 31.71 ± 6.06 and 33.18 ± 5.83 respectively (maximum score = 50, $p < 0.05$) (**Table 2**). Question #7 (Smoking may affect others' health) was the only one that failed to show a significant improvement following the education program (4.71 ± 0.77 vs. 4.59 ± 0.99, $p = 0.097$). However, this is because the baseline attitude score was already high.

The results of the practice section established that the students had very low rates of participation in anti-smoking activities (**Table 3**). About 25% of the students didn't conform to the legal prohibition on buying cigarettes when under 18 years of age and only 0.3%, 15.9% and 10.8% of students reported that they always dissuaded strangers, family and friends from smoking. It was also found that about 87% of the students fail to report illegal selling. Moreover, high school students did not actively support anti-smoking programs, which was indicated by more than one third of the students (39.2%) never having participated in educational anti-smoking campaigns.

A linear positive correlation was found between attitude and practice (correlation coefficient = 0.329, $P < 0.005$). However, no correlations were found between levels of knowledge and attitude or practice.

Discussion

The possibility of a pharmacist-initiated education program having a positive impact was confirmed by this study, which showed significant improvements in both students' knowledge and attitudes toward smoking. The pre-intervention data indicated that students' knowledge and attitudes were less than satisfactory and that educational efforts were needed to correct inaccuracies in their understanding of the subject. Additionally, the practice assessment demonstrated poor general practice regarding anti-smoking activities (**Table 3**). Whilst over 70% of the students were aware of the health consequences of the smo-

Table 5.
Difference between groups with family smokers or not prior to the intervention. Mann-Whitney test.

Categories	Items	No family smokers (184)	With family smokers (120)	P-value
Knowledge				
Common myth of smoking	3	2.21 ± 0.73	2.11 ± 0.68	0.176
General knowledge of tobacco	2	0.63 ± 0.76	0.75 ± 0.75	0.150
Health consequences	5	3.58 ± 1.36	3.43 ± 1.35	0.262
Total scores	10	6.42 ± 1.97	6.28 ± 1.92	0.492
Attitude				
Personal aspect	3	11.76 ± 2.65	11.7 ± 2.58	0.393
Social aspect	4	17.97 ± 2.52	18.3 ± 2.1	0.699
Environmental aspect	3	11.75 ± 2.56	12.1 ± 2.43	0.347
Total scores	10	41.49 ± 6.19	42.0 ± 5.8	0.517
Practice				
Personal aspect	3	7.92 ± 1.32	7.81 ± 1.68	0.529
Social aspect	4	14.76 ± 2.5	15.45 ± 8.0	P<0.012
Environmental aspect	3	8.5 ± 1.8	7.9 ± 2.0	P<0.004
Total scores	10	31.2 ± 4.9	31.2 ± 4.5	0.914

king, they did not actively try to persuade their family or friends from smoking or report stores for selling cigarettes illegally to teenagers under 18 years of age. What could be described as passive and conservative behavior in Taiwanese senior high school students regarding anti-smoking was observed, which further emphasizes the importance of making efforts towards tobacco hazard prevention on campuses.

A mild-to-moderate positive correlation was found between attitudes and practice. This supports the theory of attitude-behavior relations discussed in previous studies (Ajzen, 2001). However, this study showed no correlation between knowledge and practice, which suggests that knowledge of smoking does not guarantee good practice. This finding is also in accordance with the results of other studies demonstrating a low correlation between smoking-related knowledge and behavior (Hodgetts, Broers, & Godwin, 2004; Torabi, Yang, & Li, 2002). In the present study, the mean score of the knowledge assessment improved by 28% following the education program, with the attitude assessment rising by 3.6%. Although both improvements were statistically significant, this indicates that attitude may be much more difficult to influence. This was also demonstrated by the "Start to stop" survey conducted in Memphis, United States, which examined the effectiveness of a school-based smoking cessation program among students caught smoking at school (Robinson, Vander Weg, Riedel, Klesges, & McLain-Allen, 2003). It showed a significant improvement in tobacco-related knowledge but left attitudes unchanged. So whilst an educational program might well be able to raise the level of knowledge successfully, it does not follow that this will result in improved practice.

Not all types of education program are successful, and studies have indicated that programs using cognitive-behavioral techniques or strategies to enhance motivation lead to significantly higher cessation rates (Sussman, Sun, & Dent, 2006). The present study program attempted to enhance students' understanding by acting out the consequences of smoking and a scenario of what to do when tempted to smoke. It aimed to help students identify the social and physical consequences of smoking and develop their ability to resist peer pressure. The introduction of cigarette refusal skills, one of which is coping with peer pressure, has been found to be a successful component in smoking prevention programs (Nabors, Iobst, & McGrady, 2007). Besides the professional image pharmacists bring, using a different teaching technique other than simply doing a power-point style lecture might also have played a role in the success of the study.

One of the main limitations of this study was its short-term design as there was no follow-up surveillance to assess the long-term impact of improved attitude on students' behavior. Also, to include a control group in the future that does not get an intervention or that gets just a power point presentation not also the role playing should provide a better evidence of the effect of the intervention. Besides, due to the nature of the survey, it should be recognized that students might have underestimated their tobacco use status. The high proportion of female participants may also have an impact on the low ever-smoking rate in this study (12.2% in this study vs. 41.2% in Youth Tobacco Use Survey in Taiwan). However, the results of the study did provide some feedback which can be used to improve future programs. Different strategies focusing on enhancing active learning should be developed to further improve attitude, as it is suggested that changes in attitude rather than increased knowledge is the key to modifying behavior.

The current study also showed an interesting result indicating that students with family members who smoked were more willing to dissuade family and friends from smoking but cared less about going to places where a lot of people smoke (**Table 5**, Practice). It suggested that students who had family smokers had more opportunities and felt more comfortable asking people to quit, however, they tended to be less sensitive to the environmental tobacco smoke. Previous studies indicated that smoking within families was a key influence to youth smoking (Hill, Hawkins, Catalano, Abbott, & Guo, 2005; Keyes, Legrand, Iacono, & McGue, 2008), together with our results, this group of stu-

dents could become important members to be enrolled when we involve high school education into future anti-smoking projects.

Conclusion

This study demonstrated the efficacy of the school-based anti-smoking education program was developed by pharmacists. It also showed that health care professionals such as pharmacists can have a positive influence on high school students' attitudes towards smoking and increase their knowledge of the issues involved. Additionally, the attitude-behavior relationship was confirmed by the study. However, future efforts with continued follow-up may be needed to further evaluate the long-term impact of the program.

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Appendix

Smoking Cessation questionnaire in Mandarin

Grade: □ Second Year (11th Grade) □ Third year (12th Grade)

Gender: □ Male □ Female

Do you have relatives who smoke? □ No □ Yes. Who?_____ (e.g. mom, dad, brothers, etc.)

Please mark one of the following that best describes your situation.

□ I smoke _____cigarettes per day

□ I had smoked before, but I am not a regular smoker.

□ I have never smoked before.
Are you anticipated to try smoking in 6 months?
□ Yes □ No

Part 1: Please mark the most suitable answer.	True	False	Unknown
K1. Smoking with a filter can avoid health damage	□	□	□
K2. Oral cavity cancer is unrelated to smoking	□	□	□
K3. Gastrointestinal ulcers are unrelated to smoking.	□	□	□
K4. There is cholesterol in cigarettes	□	□	□
K5. Inhaling secondhand smoke is not real smoking, so it does no harm to our health	□	□	□
K6. Smoking will affect efficacy of some medications (e.g. contraceptives)	□	□	□
K7. Tar is the main substrate for tobacco addiction	□	□	□
K8. Light or mint cigarettes do less harm to our bodies than general ones do	□	□	□
K9. Smoking will interfere with the menstrual cycle	□	□	□
K10. Pregnant women who smoke will easily give birth to light-weight babies	□	□	□

Part 2: Please mark the item that best expresses your opinion. *In general*, *I believe that*:	Strongly Agree	Agree	No Comments	Disagree	Strongly Disagree
1. Smoking can keep up one's spirits	□	□	□	□	□
2. People can make friends through smoking	□	□	□	□	□
3. Smoking is a symbol of maturity	□	□	□	□	□
4. Smoking should be forbidden in all internet café and KTV	□	□	□	□	□
5. Smoking can make one feel relaxed	□	□	□	□	□
6. Cigarette smells make people uncomfortable	□	□	□	□	□
7. Advertisements of tobacco should be forbidden	□	□	□	□	□
8. Smoking can make me look cool	□	□	□	□	□
9. Smoking is a method to control body weight	□	□	□	□	□
10. Smoking may affect others' health	□	□	□	□	□

Part 3: Please mark the frequency of facing the situations below. Always: 90% Usually: 75% Sometimes: 50% Seldom: 25% Never: 0%	Never	Seldom	Sometimes	Usually	Always
In the half passed year…					
P1. I dissuaded strangers from smoking in the non-smoking area	□	□	□	□	□
P2. I dissuaded my family and relatives from smoking	□	□	□	□	□
P3. I dissuaded my classmates or friends who are nonage from smoking	□	□	□	□	□
P4. I reported stores selling tobacco to teenagers	□	□	□	□	□
P5. I bought tobacco for my family, friends or myself	□	□	□	□	□
P6. My relatives or friends have asked me to smoke	□	□	□	□	□
P7. I said yes when other people asked me to smoke	□	□	□	□	□
P8. I joined educational anti-smoking campaigns	□	□	□	□	□
P9. I prefer to go to smoke-free public places.	□	□	□	□	□
P10. I have been to places where a lot of people smoke (e.g. KTV, pub etc.)	□	□	□	□	□

