ORIGINAL RESEARCH ARTICLE

Protection Motivation Theory Constructs and Smoking Cessation Intention among University Students in Northeastern Thailand: A Mixed-Methods Study

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ABSTRACT

Background: Intention to quit smoking is an essential precursor to cessation. Although Protection Motivation Theory (PMT) explains smoking behavior, its link to cessation intention among Thai youth remains under-researched. This study examined university students' smoking cessation intentions and its association with PMT constructs.

Methodology: A mixed-methods study was conducted among 1,493 student smokers from six universities in Northeast Thailand (August 2024 - January 2025) using multistage sampling. Data were collected via self-administered questionnaires and in-depth interviews with 15 purposively selected smokers. Quantitative data were analyzed using multivariable logistic regression, while qualitative data underwent descriptive content analysis.

Results: Quantitatively, 48.9% of participants intended to quit. Stronger intentions were significantly associated with higher perceived severity, vulnerability, self-efficacy, and response efficacy. Conversely, intrinsic/extrinsic rewards and response costs were inversely associated with intention. Qualitative findings corroborated that awareness of smoking's harm and high self-efficacy bolstered quitting confidence. However, perceived positive effects, habitual use, social exposure to smokers, and limited information on cessation services acted as significant barriers.

Conclusions: PMT plays a significantly influential role in shaping quitting intentions. Consequently, these factors should be integrated into cessation interventions such as tailored educational programs to enhance service accessibility and strengthen the resolve to quit among youth.

Keywords: Tobacco Use Cessation, Motivation, Students, Surveys and questionnaires, Health behavior, Thailand

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Introduction

Smoking remains an important global health concern, including in Thailand. According to the World Health Organization (WHO), an estimated 19.5% of people aged 15 years and older worldwide were current tobacco users in 2024, reflecting a continued decline from previous decades. Nevertheless, tobacco use remains a major contributor to preventable morbidity and mortality, underscoring the need for sustained tobacco-control measures.[1] The prevalence of smoking among people aged 15 years and above in Thailand declined from 19.1% in 2017 to 16.5% in 2024.[2] The strategies implemented by the Thai government included banning cigarette purchases, restricting cigarette smoking in public, and implementing the smoke-free campus project.[1,2] Despite these efforts and an overall decline in smoking rates, the prevalence of smoking among Thai youth aged 15-24 years remained at 21.5% in 2024.[2] Moreover, some studies revealed that while about 13.5% of adolescents intended to quit smoking, 38.6% had no such intention.[3]

Motivation to quit is important for reducing the prevalence and associated harms of smoking.[4] Intention to quit smoking is a prerequisite for subsequent quitting attempts and successful cessation.[5,6] Therefore, promoting the intention to quit is recommended, as it has significant health benefits and enhances the impact of smoking cessation strategies.[7] However, some studies have suggested that few smoking cessation strategies are grounded in or guided by specific theories.[8] Conversely, the integration of behavioral change theories into routine smoking cessation programs has increased the effectiveness of interventions.[8,9] The Protection Motivation Theory (PMT) is a well-known behavioral change theory and is especially useful for addressing smoking behavior.[9] It posits that intention, a significant predictor of behavior, is determined by threat appraisal and coping appraisal.[10] Previous studies have indicated that the PMT is useful in predicting health-related intentions and behaviors, including smoking behavior and the intention to quit.[8,9] The theory also demonstrates strong effects in enhancing smoking prevention behaviors, increasing intentions to quit, and reducing smoking prevalence among adolescents.[8,10]

In Thailand, approximately 155 universities had adopted the smoke-free university project by 2021 to promote a healthy environment and reduce tobacco use.[11] Nevertheless, the smoking prevalence in the university age group within 20-24 years remained high at 16.5% in 2024.[2] Some studies have shown that only 35.9%[12] of university students desire to quit smoking, and 48.9% have attempted to do so,[12] with a lack of intention to quit being a major barrier.[11] Moreover, factors associated with this intention may vary across nations, reflecting their societal and cultural differences.[6] Specifically, Thai gender-related social stigma drives female smokers to have a significantly higher readiness to quit compared to males.[12] However, collectivist peer conformity and a cultural preference for self-quitting rather than utilizing healthcare services greatly impede overall cessation efforts,[11] these create significant cessation gaps.

Therefore, how these Thai contexts interact with PMT constructs should be explored. Although PMT effectively modifies Thai military smoking behaviors, its applicability remains under-explored among university students.[13] Therefore, this study aimed to examine the association between PMT constructs and the intention to quit among university students. We hypothesized that PMT constructs would be associated with smoking cessation intentions. The findings may provide evidence to promote theory-guided and culturally appropriate cessation intentions. Additionally, they will be useful for supporting effective university smoking cessation activities.

Methodology

Study design and setting: A mixed-method study was conducted from August 2024 to January 2025 at six selected universities in Northeastern Thailand.

Study participants and sampling: During the quantitative phase, we conducted a cross-sectional study. Participants were identified as current smokers if they answered "yes" to the question, "During the past 30 days, do you currently smoke cigarettes?"[14] We included current smoker undergraduate students aged 18-22 years who had no communication problems and were willing to participate but excluded those who provided incomplete questionnaires. Based on a 20.1% smoking prevalence among university students from previous research in Northeastern Thailand,[15] Cochran's formula[16] was applied with a 95% confidence interval (CI) and 2% precision. After a 5% non-response adjustment was accounted for, the target sample size was calculated as 1,625. A total of 1,493 valid responses were retained after screening for completeness, representing a 91.8% response rate. A response rate of 80% or higher is generally deemed representative of a study population, making the findings more likely to be generalizable.[17] A multistage sampling technique was employed to recruit eligible students. First, six universities based on geographical distribution were selected via lottery, representing two each from the upper, middle, and lower regions. Second, six faculties per university were chosen through lottery. Third, students were recruited through systematic random sampling (every fourth smoker); if a student was unavailable, the next on the list was contacted. For the qualitative phase, 15 smokers from the quantitative study were purposively selected for face-to-face in-depth interviews until data saturation was achieved.

Theoretical framework: The PMT serves as a theoretical framework positing that individuals are motivated to engage in self-protective behaviors when facing perceived health threats, and performing the preventative behavior can reduce the threat.[10]

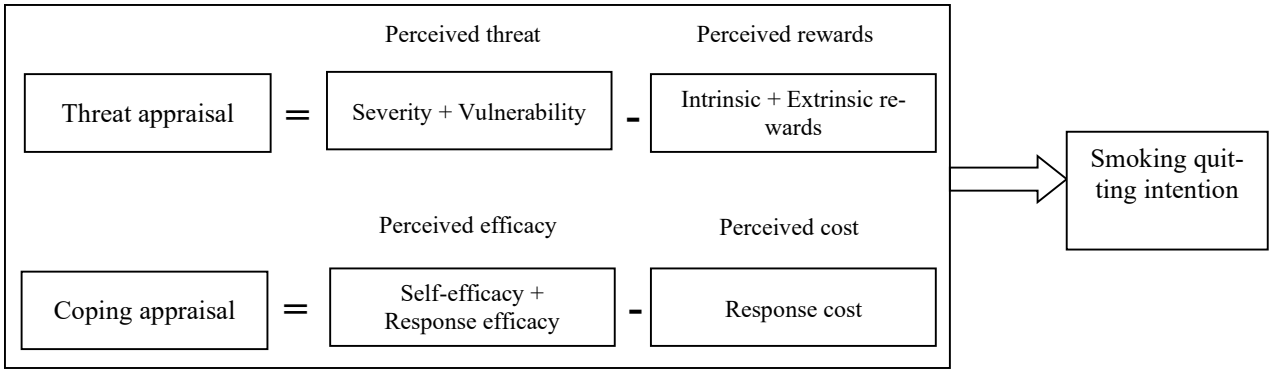

Figure 1: Protection Motivation Theory framework for intention to quit smoking.

It is widely used in predicting health intentions and behavioral changes, including smoking cessation.[8,9] In this study, we applied the PMT to examine students' quitting intention. This involved two main appraisals: threat appraisal, which encompassed perceived threat (e.g., severity and vulnerability) and perceived rewards (e.g., intrinsic and extrinsic), and coping appraisal, which included perceived efficacy (e.g., self-efficacy and response efficacy) and perceived cost (e.g., response cost) (Figure 1).

Instruments: For the quantitative phase, a self-administered questionnaire was used for data collection, comprising five parts.

Part 1: Socio-demographic factors (age, sex, monthly household income, and alcohol use) were all categorized as dichotomous variables.

Part 2: Smoking behavior-related factors, including 1) age at smoking initiation; 2) number of cigarettes smoked per day; 3) quitting attempts: participants were asked, "Have you ever tried to quit smoking in the past year?";[18] 4) advice to quit smoking: participants were asked, "In the past year, have you received advice to quit smoking?" (e.g., never, significant others [family or friends], and healthcare professionals [e.g., doctors, nurses, pharmacists, or public health officers]);[5] and 5) exposure to anti-smoking campaigns: participants were asked, "In the past year, have you been exposed to anti-smoking campaigns?" (e.g., newspaper, television, radio, social media, and health providers).[7] Responses were categorized into two groups using the median split method: ≥3 channels and <3 channels.

Part 3: Nicotine dependence was measured using the Thai version of the Fagerstrom Test for Nicotine Dependence (FTND),[19] a 6-item scale assessing physical dependence on nicotine. Questions with yes/no answers are scored 0 or 1, while multiple-choice questions are scored from 0 to 3. The sum of these scores (0-10) indicates the degree of nicotine dependence. A higher total FTND score identifies individuals with high nicotine dependence. A cut-off score of ≥6 was utilized to identify high nicotine dependence, consistent with established tobacco research.[20,21] This threshold effectively distinguishes individuals with significant physiological addiction from those with low-to-moderate dependence.[20] While the literature indicates thresholds varying from ≥4 to ≥6, the higher cut-off was adopted to prioritize the identification of individuals with clinically significant dependence. Such individuals often require intensive cessation interventions and targeted counseling regarding their readiness to quit. [20,21] This threshold was selected to ensure comparability with epidemiological data and consistency with existing research in the Asian context. Specifically, it has been widely adopted in tobacco surveys across Malaysia[22] and Thailand[23] demonstrating cross-cultural validity and reliability in assessing heavy smoking patterns among community and clinical populations. This scale showed good internal consistency, with a Cronbach's alpha of 0.82.

Part 4: PMT constructs were measured using a 21-item PMT scale adapted from the study by MacDonell K et al.[24] The scale assesses the PMT's two pathways: threat appraisal and coping appraisal. Items are rated on a 7-point Likert scale, ranging from 1 (*definitely disagree*) to 7 (*definitely agree*), with the mean scores for each subscale computed, where a higher score indicates a greater perception. The scale underwent a rigorous cross-cultural adaptation to ensure cultural and linguistic appropriateness for the Thai context. This involved a forward-backward translation process, where the original English version was translated into Thai by two independent bilingual translators and back-translated by a third to ensure semantic equivalence. Content validity was then evaluated by three experts in health psychology and youth behavior, yielding a content validity index (CVI) of 0.90 based on item relevance and clarity. This scale demonstrated good internal consistency, with a Cronbach's alpha of 0.84.

Part 5: Smoking quitting intention was assessed using the question, "Are you planning to quit smoking?" [4] Participants who answered "within a month," "within 12 months," or "will quit smoking but not within 12 months" were considered to have an intention to quit. Conversely, those responded "not planning to quit" were deemed to have no intention of quitting.

For the qualitative phase, the participants were informed about the research and its voluntary nature, which included a declaration of anonymity and con-

fidentiality. All participants then provided written informed consent. The trained researcher conducted face-to-face in-depth interviews in a private room of each university using a guide on various aspects of smoking behavior. For each interview, there were only two researchers and one participant involved. One researcher asked the interview questions while the other checked for completion of all questions and made note. Each 25-30-minute interview covered discussion topics guided by the PMT, including perceptions of smoking, reasons for initiation and continuation, intentions to quit, self-efficacy regarding quitting, anti-smoking campaigns, advice for quitting, and campus cessation services (Supplementary Appendix). Data collection concluded once saturation was achieved. The dataset was merged and reviewed by two researchers who have expertise in qualitative research and health psychology or youth behavior to ensure consistency among coders. Investigator triangulation was implemented by involving a panel of experts and multiple researchers to enhance the analytical perspective. In instances of divergent opinions, themes were finalized through collaborative dialogue and peer debriefing. Moreover, participant validation was conducted to confirm that the findings accurately represented the participants' perspectives and experiences.

Statistical analysis: In the quantitative phase, descriptive analyses were performed for participant characteristics. Multiple logistic regression was applied to investigate the relationship between sociodemographics, smoking behavior-related factors, PMT constructs, and intention to quit smoking in separate gender models, adjusting for all other predictors. All analyses were conducted using SPSS version 23.0 (IBM Corp., Armonk, NY, USA), with the significance level set at a P-value of <0.05. Descriptive content analysis was performed to examine qualitative data. A standardized data extraction form using Microsoft Excel, version 2016 (Microsoft Corp.), was used to capture the codes and quotes. Transcribed audio recordings (verbatim) were analyzed and validated into categories based on similarity by two independent researchers. All transcripts were returned to participants for comments and correction. The researchers then recorded and summarized the data.

Ethical Consideration: This study was approved by the Ethics Committee for Research Involving Human Subjects, Mahasarakham University (ref.no.407-350/2024). Written informed consent was obtained from all participants after providing detailed research protocol. Their privacy was protected, and their data will be kept confidential.

Results

Quantitative results

Participant characteristics: The characteristics and PMT construct scores of the participants are summarized in Table 1. Notably, nearly half of the participants (48.9%) expressed an intention to quit smoking. The study population consisted primarily of men, characterized by relatively low nicotine dependence. Those with an intention to quit were more likely to have prior quitting attempts and had frequently received cessation advice from healthcare providers or significant others. Regarding the PMT constructs, the participants generally reported high levels of threat appraisal specifically perceived severity and vulnerability while scoring lower on the rewards of smoking. Furthermore, higher levels of coping appraisal, particularly self-efficacy and response efficacy, were observed among those intending to quit, suggesting a strong cognitive foundation for cessation.

Quitting intention behaviors: The participants' quitting intentions varied by timeline: 31.8% and 46.7% intended to quit within 1 month and within a year, respectively, while 21.5% planned to quit but not within a year. The key drivers included awareness of smoking's harm (92.9%), health concerns (91.2%), family and friend disapproval (88.9%), and family encouragement (86.0%). Regarding support, the participants primarily sought assistance from hospital quitting clinics (55.3%), Quitline 1600 (42.6%), and community pharmacies (35.1%). The most common strategies reported for maintaining cessation were avoiding other smokers (65.6%) and increasing physical activity (64.1%) (Figure 2).

Factors associated with quitting intention: Approximately 48.9% of all participants intended to quit smoking. Specifically, 47.1% of the male participants (409/868) and 51.4% of the female participants (321/625) reported an intention to quit. Thereafter, a sex-stratified subgroup analysis was conducted to explore the sex-specific predictors of cessation intention.

The sex-stratified subgroup analysis revealed that the multivariable logistic regression model significantly predicted the participants' intention to quit smoking ($P < 0.05$). The model accounted for 44.3% of the total variance ($R^2 = 0.443$) for the male participants and 44.4% of the total variance ($R^2 = 0.444$) for the female participants.

The predictors of the intention to quit were consistent across both models. Regarding smoking behavior-related factors, the participants were more likely to express a desire to quit if they had previously attempted to quit at least once, had low nicotine dependence, were exposed to three or more anti-smoking campaign channels, or received cessation advice from healthcare professionals or significant others ($P < 0.05$). Notably, there were no significant associations found between the socio-demographic factors and the intention to quit (Tables 2 and 3).

All PMT constructs were significantly associated with quitting intentions. Specifically, threat appraisal revealed that perceived severity and vulnerability correlated with higher quitting intentions, whereas intrinsic and extrinsic rewards were related to lower quitting intentions.

Table 1: Distribution of socio-demographic and smoking-related factors by smoking quitting intention

Variables	Total (n=1493) N (%)	Smoking quitting intention	
		Intention to quit (n=730) N (%)	No intention to quit (n=763) N(%)
Socio-demographic factors			
Age (year) (mean ± SD)	19.8±1.4	19.8±1.5	19.7±1.4
Sex			
Male	868 (58.1)	409 (56.0)	459 (60.2)
Female	625 (41.9)	321 (44.0)	304 (39.8)
Monthly household income (THB)			
< 10,000	689 (46.1)	352 (48.2)	337 (44.2)
≥ 10,000	804 (53.9)	378 (51.8)	426 (55.8)
Alcohol use behavior			
Never drinking	745 (49.9)	375 (51.4)	370 (48.5)
Drinking	748 (50.1)	355 (48.6)	393 (51.5)
Smoking behavior-related factors			
Age of smoking initiation (year) (mean ± SD)	15.7±1.4	15.7±1.5	15.6±1.4
Cigarettes smoked per day (cigarette)(mean± SD)	5.8±2.9	5.66±3.3	5.97±2.5
Nicotine dependence			
Low dependence	764 (51.2)	426 (58.4)	338 (44.3)
High dependence	729 (48.8)	304 (41.6)	425 (55.7)
Quit attempts in the past year			
No	819 (54.9)	358 (49.0)	461 (60.4)
Yes (at least one)	674 (45.1)	372 (51.0)	302 (39.6)
Exposure to anti-smoking campaigns (channels)			
< 3	698 (46.8)	315 (43.2)	383 (50.2)
≥ 3	795 (53.2)	415 (56.8)	380 (49.8)
Advise to quit smoking			
Significant others (family, friends)	352 (23.6)	198 (27.1)	154 (20.2)
Healthcare professionals	488 (32.7)	252 (34.5)	236 (30.9)
Never	653 (43.7)	280 (38.4)	373 (48.9)
PMT construct scores (mean ± SD)			
Threat appraisal			
Perceived severity	4.4±0.5	4.5±0.4	4.3±0.5
Perceived vulnerability	4.3±0.7	4.4±0.7	4.1±0.6
Intrinsic rewards	3.8±0.7	3.6±0.7	3.9±0.6
Extrinsic rewards	3.6±0.8	3.3±0.7	3.8±0.6
Coping appraisal			
Self-efficacy	3.9±0.7	4.1±0.7	3.7±0.6
Response efficacy	3.9±0.6	4.0±0.6	3.8±0.6
Response cost	3.6±0.8	3.4±0.8	3.7±0.7

Note. Values are presented as numbers (%) or means ± SD; SD, Standard deviations; THB, Thai Baht

Furthermore, coping appraisal demonstrated that self-efficacy and response efficacy were related to increased intentions to quit. Conversely, response cost was associated with decreased quitting intentions after adjusting for all predictors ($P < 0.05$) (Tables 2 and 3).

Qualitative results: The main themes and subthemes of the participants' opinions on smoking based on the PMT framework are as follows: [Table 4]

A) Perceived threat

Perceived severity

Severity of smoking's harm: Most participants could identify a few health consequences, from mild symptoms to serious chronic illnesses, mainly respiratory and lung cancer:

Effects of smoking and tobacco use: The participants acknowledged smoking-related lung diseases but perceived health risks as distant consequences linked to smoking duration. Furthermore, social barriers specifically body odor and smoke hindered their participation in university activities:

Perceived vulnerability

Perceived harm of smoking: Most participants agreed that smoking can cause cancer and other negative effects, such as fatigue, yellow teeth, dark lips and skin, and difficulty breathing. Moreover, they mentioned that smoking can also harm their family, as secondhand smoke exposure can lead to illness:

Self-awareness of smoking's harm: Several participants were concerned about smoking's negative effects and social stigma, leading them to attempt to quit or reduce daily cigarette consumption. However, some participants claimed they were not addicted to tobacco. They stated that smoking entertained and relaxed them and relieved their stress:

B) Perceived rewards

Intrinsic rewards

Reasons for starting smoking: The primary reason for initiating smoking was peer influence. Several participants noted that cigarettes were readily available through friends and were often shared among peers:

Reasons for continuing smoking: The participants' reasons for continuing smoking were stress relief, socialization with friends, relaxation, activity, and habitual behavior:

Extrinsic rewards

Social norms toward smoking: Most participants perceived that smoking is socially unacceptable; in particular, smoking in public is prohibited and undesirable. However, they asserted that smoking is seen as a pleasant way to socialize with other smokers, including friends and relatives:

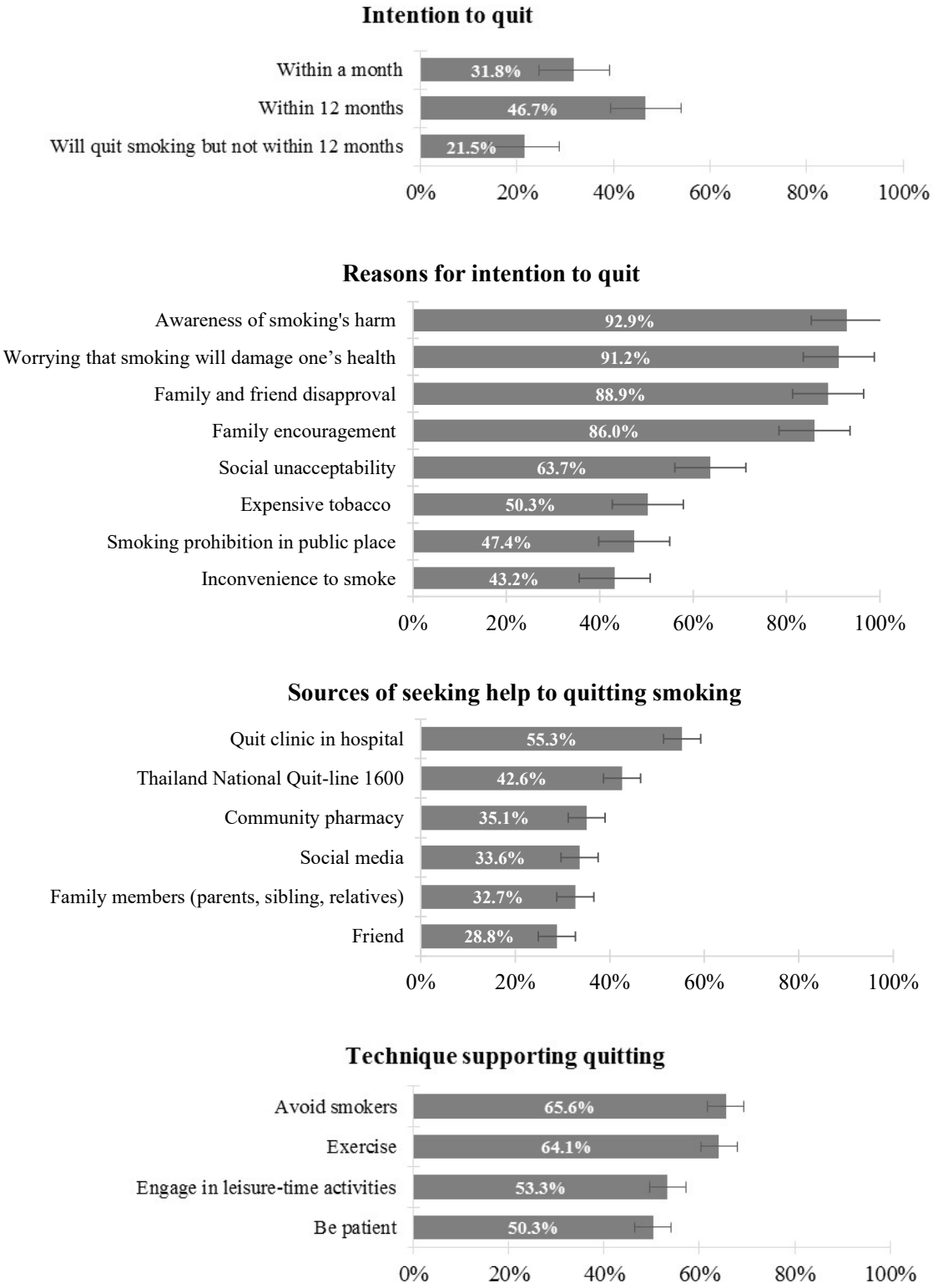

Figure 2: Percentages (%) of responses regarding quitting intention behaviors among students with intention to quit

Table 2: Odds ratios and 95% confidence intervals from logistic regression for intention to quit smoking among male students

Variables	Bivariate model		Multivariate model	
	Unadjusted OR (95%CI)	*P*-value	aOR (95%CI)	*P*-value
Socio-demographic factors				
Age (y)	1.11 (0.97-1.21)	0.205	1.07 (0.95-1.20)	0.215
Monthly household income <10,000 (ref: ≥ 10,000, THB)	1.26 (0.96-1.66)	0.096	1.27 (0.88-1.84)	0.197
Never drinking (ref: drinking)	1.13 (0.85-1.47)	0.187	1.12 (0.79-1.59)	0.513
Smoking behavior-related factors				
Age to start smoking (y)	1.01 (0.92-1.09)	0.160	0.94 (0.83-1.06)	0.275
Cigarettes smoked per day (cigarette)	1.03 (0.96-1.05)	0.185	1.02 (0.96-1.09)	0.358
Low nicotine dependence (ref.: High dependence)	1.97 (1.50-2.59)	<0.001	1.55 (1.19-2.17)	0.003
Quit attempts (yes, at least one) (ref.: No)	1.90 (1.44-2.52)	<0.001	2.37 (1.62-3.46)	<0.001
Exposure to anti-smoking campaigns, ≥ 3 channels (ref.:<3)	1.12 (1.09-1.47)	0.009	1.49 (1.14-2.13)	0.006
Advise to quit smoking				
Significant others (ref: Never)	2.40 (1.71-3.38)	<0.001	2.48 (1.63-3.80)	<0.001
Healthcare professionals (ref.: Never)	1.83 (1.34-2.51)	<0.001	2.11 (1.40-3.18)	<0.001
PMT construct scores				
Threat appraisal				
Perceived severity	2.99 (2.22-4.04)	<0.001	2.36 (1.55-3.60)	<0.001
Perceived vulnerability	1.94 (1.57-2.38)	<0.001	1.66 (1.24-2.23)	0.001
Intrinsic rewards	0.55 (0.45-0.67)	<0.001	0.58 (0.44-0.77)	<0.001
Extrinsic rewards	0.36 (0.29-0.43)	<0.001	0.40 (0.31-0.51)	<0.001
Coping appraisal				
Self-efficacy	2.21 (1.79-2.72)	<0.001	2.52 (1.90-3.35)	<0.001
Response efficacy	1.66 (1.33-2.06)	<0.001	1.35 (1.18-1.80)	0.004
Response cost	0.48 (0.40-0.57)	<0.001	0.63 (0.51-0.80)	<0.001

Note: aOR, Adjusted odds ratios; OR. Odds ratio; CI, Confidence interval; ref, Reference group; THB, Thai Baht

Table 3: Odds ratios and 95% confidence intervals from logistic regression for intention to quit smoking among female students

Variables	Bivariate model		Multivariate model	
	Unadjusted OR (95%CI)	*P*-value	aOR (95%CI)	*P*-value
Socio-demographic factors				
Age (y)	0.96 (0.87-1.07)	0.148	1.02 (0.89-1.17)	0.727
Monthly household income <10,000 (ref: ≥ 10,000, THB)	1.14 (0.83-1.57)	0.113	1.12 (0.87-1.52)	0.273
Never drinking (ref: drinking)	1.12 (0.81-1.55)	0.187	1.01 (0.66-1.54)	0.957
Smoking behavior-related factors				
Age to start smoking (y)	0.88 (0.79-1.09)	0.119	0.96 (0.83-1.12)	0.657
Cigarettes smoked per day (cigarette)	0.92 (0.87-1.09)	0.101	0.98 (0.91-1.06)	0.769
Low nicotine dependence (ref.: High dependence)	1.81 (1.32-2.49)	<0.001	1.74 (1.13-2.67)	0.001
Quit attempts (yes, at least one) (ref.: No)	1.99 (1.45-2.75)	<0.001	1.89 (1.17-3.06)	0.003
Exposure to anti-smoking campaigns, ≥3 channels (ref.:<3)	1.75 (1.26-2.44)	0.001	1.87 (1.22-2.89)	0.004
Advise to quit smoking				
Significant others (ref: Never)	2.60 (1.69-3.98)	<0.001	2.77 (2.18-4.52)	<0.001
Healthcare professionals (ref.: Never)	1.74 (1.22-2.49)	0.002	1.99 (1.26-3.15)	0.003
PMT construct scores				
Threat appraisal				
Perceived severity	2.69 (1.88-3.84)	<0.001	2.18 (1.99-4.88)	<0.001
Perceived vulnerability	1.35 (1.12-1.85)	0.005	1.95 (1.29-2.96)	0.002
Intrinsic rewards	0.56 (0.44-0.72)	<0.001	0.53 (0.38-0.75)	<0.001
Extrinsic rewards	0.38 (0.31-0.48)	<0.001	0.39 (0.29-0.51)	<0.001
Coping appraisal				
Self-efficacy	2.39 (1.87-3.07)	<0.001	2.78 (2.02-3.81)	<0.001
Response efficacy	1.90 (1.48-2.44)	<0.001	1.57 (1.15-2.15)	0.004
Response cost	0.61 (0.50-0.75)	<0.001	0.68 (0.52-0.89)	0.005

Note: aOR, Adjusted odds ratios; OR. Odds ratio; CI, Confidence interval; ref, Reference group; THB, Thai Baht

C) Perceived efficacy

Self-efficacy

Self-efficacy to quit smoking: The participants expressed a desire to quit but anticipated difficulties due to low self-efficacy, stress, and social pressure. While prioritizing personal willingness as the key success factor, many participants who attempted independent cessation relapsed due to stress and withdrawal symptoms:

Intention to quit smoking and its reasons: Despite awareness of smoking's harms, many participants resisted quitting due to stress, social environments, and perceived relaxation; some preferred reduction over cessation. Conversely, the quitting drivers reported included family encouragement and healthcare advice:

Response efficacy

Source of help for quitting smoking: The participants sought cessation support from various sources, including family, friends, healthcare providers, social media, and quitting clinics. While some participants preferred private services, including phone or online counseling, others favored self-directed cessation:

Table 4: Thematic analysis of interviews with current smokers

Main themes	Subthemes	Participants quotes
A) Perceived threat	Severity of smoking's harm	*"Everyone said smoking is harmful, but what are the specific effects?" (P4)*
-Perceived severity		*"Smoking can cause many respiratory diseases like chronic obstructive pulmonary disease, which can progress to difficult-to-treat cancer." (P10)*
	Effects of smoking and tobacco use	*"I avoid meeting friends due to the fear that they may dislike my smell after smoking." (P2)*
		"Should I be hospitalized or contract a smoking-related disease, my parents would be regretful." (P15)
-Perceived vulnerability	Perceived harm of smoking	*"I am acutely aware of how smoking compromises my daily physical functioning and alters my appearance, from labored breathing to the staining of my teeth and skin." (P8)*
		"I worry that smoking will lead to comorbidities and affect my family's health, so I'll quit." (P12)
	Self-awareness of smoking's harm	*"I recognize the health risks associated with tobacco use, which has driven my continuous efforts to reduce my daily consumption." (P1)*
		"I believe I can quit anytime because I'm not addicted or nicotine-dependent; it helps with psychological relaxation and stress management." (P3)
B) Perceived rewards	Reasons for starting smoking	*"My friends in the gang all smoked and invited me to join; I wanted to be included." (P5)*
-Intrinsic rewards		*"We sometimes share the cost of cigarettes." (P14)*
	Reasons for continuing smoking	*"I understand non-smokers find smoking harmful, but to me, it's just a habit." (P9)*
-Extrinsic rewards		*"When tense, I smoke to relax; it's the fastest way to feel good." (P3)*
	Social norms toward smoking	*"Smoking is an unwelcome behavior, with social norms increasingly opposing it." (P7)*
		"I view smoking as a 'pleasant bridge' to socialization; it provides a dedicated space and time to converse and bond with peers who also smoke." (P9)
C) Perceived efficacy	Self-efficacy to quit smoking	*"I can quit smoking anytime; it's just for fun, and I'm able to stop when I choose to." (P9)*
-Self-efficacy		*"I tried to quit for a month but relapsed due to tension." (P11)*
	Intention to quit smoking and its reasons	*"The greatest difficulty in quitting was my friends and family inviting me to smoke." (P5)*
		"Though I know smoking is harmful, I'm not experiencing problems and don't wish to quit now. I'll reduce my intake and slowly stop." (P4)
		"Encouragement from my family and direct advice from healthcare professionals have been instrumental in shifting my intention toward quitting." (P7)
-Response efficacy	Source of help for quitting smoking	*"My mother hates smoking and advises me to quit, believing it's harmful." (P3)*
		"I believe I can control myself and quit smoking if I truly want to." (P9)
		"I prefer private counseling via phone or online platforms because it offers a level of anonymity and convenience that traditional face-to-face meetings lack." (P1)
	Campus smoking cessation services	*"Providing professional counseling through online channels would lower the barrier for students who feel stigmatized by their tobacco use." (P12)*
		"The university should foster cessation by replacing smoking areas with green spaces and activity hubs, providing healthier alternatives for stress relief and socialization." (P2)
D) Perceived cost	Barrier to smoking cessation	*"Smoking has become an everyday habit; it just feels like part of my routine now. Thus, it is difficult to quit." (P3)*
-Response cost		*"I am reluctant to seek professional help because of the social stigma attached to smoking; the shyness about being identified as a 'smoker' prevents me from reaching out." (P1)*
	Anti-smoking campaigns	*"Seeing the pictorial warnings and health news on social media makes the risks feel real; it's a constant push for me to attempt to quit." (P2)*
		"The university should continue promoting cessation services alongside strict campus policies to support students in the long run; these include strict no-smoking zones, digitized counseling via social media, peer-to-peer support programs, and stress-relief workshops as healthy alternatives." (P14)

Campus smoking cessation services: The participants recommended university-led cessation support, including formal programs, online counseling, and social media counseling (e.g., Line). They also suggested reducing designated smoking zones to prioritize more activity-oriented spaces:

D) Perceived cost

Response cost

Barrier to smoking cessation: The reported primary barriers to cessation included habitual use, stress, constant invitations to smoke from friends or family, and the ease of smoking when alone. Furthermore, the participants struggled to access support due to shyness, reluctance to contact the Quitline, and insufficient information regarding service locations:

Anti-smoking campaigns: The participants identified anti-tobacco media, pictorial warnings, and health-related news as the key motivators for cessation. To reinforce these efforts, they recommended sustained smoke-free policies, visible signage in public and university spaces, and the expansion of campus-based quitting services:

Discussion

Intention to quit: Our study found that 48.9% of students intended to quit smoking, with 31.8% planning to do so within a month. Primary motivators included health concerns, social disapproval, and family encouragement. Aligning with previous research, [6,12] smokers valuing health were more likely to intend to quit. Additionally, social support significantly influenced quitting attempts. [5,6,12] These findings suggest that Thai adolescents' motivation stems from personal health and social factors. Consequently, interventions should integrate education on tobacco-related harms with social support strategies to effectively promote cessation.

PMT constructs and factors associated with quitting intentions: In our study, sex-stratified multivariate analysis yielded Nagelkerke R^2 values of 0.443 for male students and 0.444 for female students, indicating that the models account for approximately 44% of the variance in smoking cessation intentions. In behavioral research, an R^2 of this magnitude reflects substantial explanatory power, notably exceeding values reported in similar studies in China (0.230-0.240) [18] and India (0.322) [25], while remaining comparable to previous Thai findings (0.450). [26] While the interpretation of "good" R^2 values varies across disciplines ranging from 0.15-0.20 in clinical research to higher benchmarks in physical sciences - social sciences typically regard values between 0.10 and 0.50 as acceptable due to the inherent complexity of human behavior.[27] Consequently, our models' R^2 values significantly exceed the common threshold for meaningful behavioral insights. This suggests that the PMT constructs employed in our framework are highly relevant and effective in predicting smoking cessation intentions among Thai university students.

Our results demonstrate that PMT constructs significantly influence quitting intentions. Within threat appraisal, higher perceived severity and vulnerability strengthen the drive for self-protection and cessation. [8,9,10] Conversely, nicotine dependence is inversely associated with motivation to quit, acting as a major barrier even when smokers underestimate their addiction. [6] Consistent with recent evidence, these findings underscore the necessity of evaluating physiological dependence to predict quitting intent accurately. [28] Consequently, interventions should not only educate on tobacco-related harms but also prioritize awareness of nicotine dependence. [6] Addressing both harm perception and physical addiction is crucial for fostering robust quitting intentions and achieving successful cessation among Thai university students. Conversely, higher intrinsic and extrinsic rewards such as stress relief and socialization significantly decrease quitting intentions. As perceived benefits diminish, motivation to quit increases. [8,9] Since these rewards often obstruct cessation despite harm awareness, healthcare providers should prioritize rectifying these positive perceptions to effectively strengthen smokers' intentions to quit.

Regarding coping appraisal, our results indicate that greater perceived efficacy comprising self-efficacy and response efficacy is positively associated with quitting intentions. Self-efficacy emerged as the most potent predictor. Specifically, multivariable analysis revealed that male students with high self-efficacy were 2.52 times more likely to intend to quit (aOR = 2.52; 95% CI = 1.90-3.35). This association was even more pronounced among female students, who demonstrated a 2.78-fold increase (aOR = 2.78; 95% CI = 2.02-3.81). Consistent with prior research, [8,9] when individuals believe quitting effectively mitigates health risks and feel confident in their ability to succeed, the perceived costs of cessation diminish. This dual-processing mechanism suggests that the desire to quit is driven not merely by fear, but by the confidence to adopt a smoke-free lifestyle. [8,10] Consequently, higher self-efficacy significantly strengthens the resolve to achieve abstinence. [8,9] Therefore, interventions should prioritize mastering cessation skills and bolstering self-belief to effectively enhance quitting intentions among adolescent smokers. We also found that prior attempts significantly influence quitting intentions, as past experiences reinforce motivation and desire. [5,6] Our findings suggest that enhancing self-efficacy is crucial, particularly for those with previous attempts. Therefore, smokers should be encouraged to persist, as high confidence and sustained motivation are key drivers for future cessation success.

Quitting intentions are driven by response efficacy the beliefs that smoking cessation is an effective means to reduce health threats and significantly improve overall health. [8] However, awareness alone is insufficient; social support and professional advice are vital. [4,5,12] Our findings confirm that encourage-

ment from family, friends, and healthcare providers significantly increases motivation. [4,5] Furthermore, students expressed a preference for accessible, university-promoted cessation services, including online options. [11] Research suggests that offering diverse, tailored programs including online counseling and reduced designated smoking areas improves accessibility and strengthens the desire to quit. Therefore, integrating social encouragement with accessible, multifaceted interventions is essential for fostering successful smoking cessation among university students.

In the current study, the smokers who reported greater response costs were less likely to intend to quit. Evidence suggests that higher response costs including monetary, time, and social factors significantly hinder quitting intentions by reducing confidence. [29] Consequently, universities should implement cessation programs and anti-smoking campaigns specifically designed to help smokers overcome these perceived barriers, thereby increasing their motivation to quit.[12,29]

Strengths and Limitations

This study applied the Protection Motivation Theory (PMT) to identify predictors of smoking cessation intention among university students, providing a useful framework for developing campus-based tobacco control strategies and PMT-driven interventions that strengthen risk perception, quitting efficacy, and self-efficacy.

Several limitations should be considered. First, the cross-sectional design precludes causal inference; longitudinal and intervention studies are needed to confirm causal relationships and evaluate PMT-based cessation programs. Second, the sample comprised only university student smokers from Northeastern Thailand, limiting generalizability. The relatively high proportion of female smokers may reflect self-selection bias, as women are often more likely to participate in health-related surveys and report quitting intentions. Future studies should employ stratified random sampling to ensure representative sex distribution. Third, despite multistage sampling and a high response rate (91.8%), selection and non-response biases cannot be excluded. Broader, multi-regional studies are warranted. Fourth, smoking behavior and quitting intention were self-reported and may be affected by social desirability bias; future research should incorporate biochemical verification and longitudinal follow-up of cessation outcomes. Finally, although a validated Thai PMT scale was unavailable, rigorous translation and adaptation procedures produced a tool with good content validity (CVI=0.90).

Conclusion

This study demonstrates that PMT constructs significantly influence quitting intentions through threat appraisal and coping appraisal. These insights provide a targeted perspective for developing effective cessation support. To enhance quitting attempts, universities should implement PMT-based interventions, such as specialized education, counseling, and anti-smoking campaigns, while expanding accessible cessation services to address the specific needs of student smokers

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References

1. World Health Organization (WHO). WHO global report on trends in prevalence of tobacco use 2000-2024 and projections 2025-2030. Geneva: World Health Organization; 2025. 8-10. Available at: https://www.who.int/publications/i/item/9789240116276 (Accessed March 6th, 2026)
2. National Statistical Office. Ministry of Digital Economy and Society. The 2024 Survey on smoking and drinking situation of population. Bangkok: National Statistical office; 2024. 14-15. [Thai]. Available at: https://www.nso.go.th/nsoweb/storage/survey_detail/2026/20250401100215_56719.pdf (Accessed on January 13th, 2025)
3. Aekplakorn W, Puckcharern H, Satheannoppakao W. The 6th Thai national health examination survey 2019 2020. Nonthaburi: Health System Research Institute; 2021. 169 72. [Thai]. Available at: https://www.hiso.or.th/hiso/picture/reportHealth/report/sreport6/sreport6_full.pdf (Accessed on January 20th, 2025)

4. Sun S, Yu H, Ling J, Yao D, Chen H, Liu G. The influence of health literacy and knowledge about smoking hazards on the intention to quit smoking and its intensity: an empirical study based on the data of China's health literacy investigation. BMC Public Health. 2023;23(1):2355. DOI: https://doi.org/10.1186/s12889-023-17292-1

5. Hwang JH, Park SW. Smoking Cessation Intention and Its Association with Advice to Quit from Significant Others and Medical Professionals. Int J Environ Res Public Health. 2021 Mar 12;18(6):2899. DOI: https://doi.org/10.3390/ijerph18062899 PMid:33809014

6. Han M, Seo D, Kim Y, Seo HG, Cho SI, Lee S, et al. Factors Associated with Quit Intentions among Adult Smokers in South Korea: Findings from the 2020 ITC Korea Survey. Int J Environ Res Public Health. 2022 Aug 31;19(17):10839. DOI: https://doi.org/10.3390/ijerph191710839 PMid:36078553

7. Hoang LT, Tuyet Hanh TT, Khue LN, Hai PT, Can PV, Long KQ, et al. Intention to Quit and Predictive Factors Among Current Smokers in Vietnam: Findings From Adult Tobacco Survey 2020. Tob Use Insights. 2022 Apr 29;15:1179173X221098460. DOI: https://doi.org/10.1177/1179173X221098460

8. Lin H, Chen M, Yun Q, Zhang L, Chang C. Protection motivation theory and smoking quitting intention: findings based on structural equation modelling and mediation analysis. BMC Public Health. 2022 Apr 27;22(1):838. DOI: https://doi.org/10.1186/s12889-022-13263-0

9. Lin HX, Chang C. Factors associated with the quitting intention among Chinese adults: Application of protection motivation theory. Curr Psychol 2023;42:1083-1091. DOI: DOI: https://doi.org/10.1007/s12144-021-01500-5

10. Balla J, Hagger MS. Protection motivation theory and health behaviour: conceptual review, discussion of limitations, and recommendations for best practice and future research. Health Psychol Rev. 2025 Mar;19(1):145-171. DOI: https://doi.org/10.1080/17437199.2024.2413011

11. Olson PS, Suttiruksa S, Chummalee I, Seesin T, Nithipaichit R, Promarak T, et al. Evaluating smokers' opinions on smoking and customized cessation in a Thailand University context: A qualitative study. Tob Induc Dis. 2024;22(4):58. DOI: https://doi.org/10.18332/tid/185293 PMid:38572184

12. Chinwong D, Mookmanee N, Chongpornchai J, Chinwong S. A Comparison of Gender Differences in Smoking Behaviors, Intention to Quit, and Nicotine Dependence among Thai University Students. J Addict. 2018 Oct 24;2018:8081670. DOI: https://doi.org/10.1155/2018/8081670 PMCid:PMC6220393

13. Chalermrueangrong J, Preechawong S. Effect of the motivation program to quit smoking in Royal Thai Air Force officers with non-communicable disease risks. J Health Res. 2019;33(5):416-424. DOI: https://doi.org/10.1108/JHR-11-2018-0143

14. Global Youth Tobacco Survey Collaborative Group. Global Youth Tobacco Survey (GYTS): Core Questionnaire with Optional Questions, Version 2.3. Atlanta, GA: U.S. National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2023. Available at: https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/gyts2023_core_questionnaire_v2.3_aug_2023.pdf?sfvrsn=f763ac85_13 (Accessed on January 20th, 2025)

15. Nakju S, Laohasiriwong W, Sornlom K, Soeung K. Law enforcement on tobacco control and smoking among youths in the northeast of Thailand. Indian J Public Health Res Dev 2020;11(3):2356-2361.

16. Cochran WG. Sampling Techniques. 3rd ed. New York: John Wiley and Sons. 1977. p 75.

17. Fincham JE. Response rates and responsiveness for surveys, standards, and the journal. Am J Pharm Educ. 2008;72(2):43. DOI: https://doi.org/10.5688/aj720243 PMid:18483608

18. Lin H, Chen M, Yun Q, Zhang L, Chang C. Tobacco dependence affects determinants related to quitting intention and behaviour. Sci Rep. 2021 Oct 12;11(1):20202. DOI: https://doi.org/10.1038/s41598-021-99766-z

19. Heatherton TF, Kozlowski LT, Frecker RC, Fagerström KO. The Fagerström Test for Nicotine Dependence: a revision of the Fagerström Tolerance Questionnaire. Br J Addict. 1991 Sep;86(9):1119-1127. DOI: https://doi.org/10.1111/j.1360-0443.1991.tb01879.x PMid:1932883

20. Diaz FJ, Jané M, Saltó E, Pardell H, Salleras L, Pinet C, de Leon J. A brief measure of high nicotine dependence for busy clinicians and large epidemiological surveys. Aust N Z J Psychiatry. 2005 Mar;39(3):161-168. DOI: https://doi.org/10.1080/j.1440-1614.2005.01538.x

21. Fagerström KO, Kunze M, Schoberberger R, Breslau N, Hughes JR, Hurt RD, et al. Nicotine dependence versus smoking prevalence: comparisons among countries and categories of smokers. Tob Control. 1996 Spring;5(1):52-56. DOI: https://doi.org/10.1136/tc.5.1.52 PMid:8795860

22. Lim KH, Cheong YL, Sulaiman N, Yah XY, Mahadzir ME, Lim JH, et al. Agreement between the Fagerström test for nicotine dependence (FTND) and the heaviness of smoking index (HSI) for assessing the intensity of nicotine dependence among daily smokers. Tob Induc Dis. 2022 Nov 25;20:105. DOI: https://doi.org/10.18332/tid/155376 PMid:36474605

23. Thaworncheep P, Jianramas N, Issapak S, Rajphithak S, Waedoko S, Bin-arwa S, et al. Comparing harm perception and nicotine dependence between adult roll-your-own and factory-made cigarette smokers in Southern Thailand. J Health Sci Med Res 2025;43(6):e20251183. DOI: https://doi.org/10.31584/jhsmr.20251183

24. Macdonell K, Chen X, Yan Y, Li F, Gong J, Sun H, et al. A Protection Motivation Theory-Based Scale for Tobacco Research among Chinese Youth. J Addict Res Ther. 2013 Jul 8;4:154. DOI: https://doi.org/10.4172/2155-6105.1000154

25. Panigrahi A, Sharma D, Maharana S. Intention to quit tobacco use and its determinants among adolescent tobacco users residing in slum areas of Bhubaneswar, India: A cross-sectional study. Ind J Med Paediatr Oncol 2021;42:444-450. DOI: https://doi.org/10.1055/s-0041-1740602

26. Phoophong S, Krainuwat K, Nakagasien P. Predicting factors of intention to quit smoking among employees in public health centers, Bangkok metropolitan administration. NURS SCI J THAIL 2020;38(3):63-77.

27. Ozili PK. The acceptable R-square in empirical modelling for social science research. SSRN Electronic Journal 2023:1-9. DOI: https://doi.org/10.2139/ssrn.4128165

28. Chen L, Tao Z, Xu Q, Zhu Y, Ding S, Dong Y. Nicotine dependence, motivations, and intention to quit smoking among smoking cessation outpatients: A cross-sectional study. Tob Induc Dis. 2025 Jul 18;23. DOI: https://doi.org/10.18332/tid/205671 PMid:40689340

29. Alanazi F, Mohamed WJM, Konstantinidis ST, Blake H. Barriers and Facilitators to Smoking Cessation Among University Students: A Scoping Review. Int J Environ Res Public Health. 2025;22(6):947. DOI: https://doi.org/10.3390/ijerph22060947 PMid:40566373

30. Keusch, F. Why do people participate in web surveys? Applying survey participation theory to internet survey data collection. Manag Rev Q 2015;65:183-216. DOI: https://doi.org/10.1007/s11301-014-0111-y

31. Glass DC, Kelsall HL, Slegers C, Forbes AB, Loff B, Zion D, et al. A telephone survey of factors affecting willingness to participate in health research surveys. BMC Public Health. 2015 Oct 5;15:1017. DOI: https://doi.org/10.1186/s12889-015-2350-9

32. Wong SL, Shields M, Leatherdale S, Malaison E, Hammond D. Assessment of validity of self-reported smoking status. Health Rep. 2012 Mar;23(1):47-53. PMID: 22590805.