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SMOKING-RELATED BEHAVIOR AND MOTIVATION TO QUIT SMOKING AMONG ENGINEERING STUDENTS AT UNIVERSITAS PEJUANG REPUBLIK INDONESIA

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ABSTRACT

Smoking prevalence among Indonesian university students remains alarmingly high, particularly among male students in engineering faculties; however, empirical evidence on the behavioral determinants of cessation motivation in this population is limited. Understanding the interplay between health knowledge, attitudes, and cessation-related actions is critical for designing evidence-based smoking cessation programs tailored to the university context. This study aimed to analyze the relationship between smoking-related behavior (knowledge, attitudes, and actions) and motivation to quit smoking among engineering students at Universitas Pejuang Republik Indonesia. An analytical observational study with a cross-sectional design was conducted. A total of 105 active smokers were recruited through purposive sampling from the Faculty of Engineering. Data were collected using a researcher-developed structured questionnaire comprising 40 Likert-scale items across four domains (knowledge, attitudes, actions, and motivation to quit). The instrument was validated through pilot testing (n=30) and demonstrated good internal consistency (Cronbach's alpha: 0.78–0.85). Bivariate analysis was performed using chi-square tests and Fisher's exact test with a significance level of α=0.05. The majority of respondents demonstrated good knowledge (96.19%), positive attitudes (92.38%), positive actions (77.14%), and high motivation to quit smoking (84.76%). Statistically significant associations were observed between motivation to quit smoking and knowledge (p=0.045; OR=4.89), attitudes (p=0.037; OR=5.23), and actions (p=0.044; OR=2.87). All three behavioral components were significantly associated with motivation to quit smoking. Attitudes demonstrated the strongest association, suggesting that university-based smoking cessation programs should prioritize attitude-modification strategies, such as motivational interviewing and peer support groups, complemented by behavioral skills training and smoke-free campus policies.

Kata Kunci:

Sikap;
Pengetahuan;
Tindakan;
Motivasi berhenti merokok;
Mahasiswa

ABSTRAK

Prevalensi merokok di kalangan mahasiswa Indonesia masih sangat tinggi, terutama pada mahasiswa laki-laki di fakultas teknik, namun bukti empiris mengenai determinan perilaku terhadap motivasi berhenti merokok pada populasi ini masih terbatas. Memahami keterkaitan antara pengetahuan kesehatan, sikap, dan tindakan terkait berhenti merokok sangat penting untuk merancang program berhenti merokok berbasis bukti yang sesuai dengan konteks perguruan tinggi. Penelitian ini bertujuan menganalisis hubungan antara perilaku terkait merokok (pengetahuan, sikap, dan tindakan) dengan motivasi berhenti merokok pada mahasiswa teknik Universitas Pejuang Republik Indonesia. Penelitian observasional analitik dengan desain cross-sectional dilakukan terhadap 105 perokok aktif yang direkrut melalui purposive sampling dari Fakultas Teknik. Data dikumpulkan menggunakan kuesioner terstruktur yang dikembangkan peneliti terdiri dari 40 item skala Likert pada empat domain (pengetahuan, sikap, tindakan, dan motivasi berhenti), yang telah divalidasi melalui uji coba (n=30) dan menunjukkan konsistensi internal baik (Cronbach's alpha: 0,78–0,85). Analisis bivariat menggunakan uji chi-square dan uji Fisher exact dengan tingkat signifikansi α=0,05. Mayoritas responden menunjukkan pengetahuan baik (96,19%), sikap positif (92,38%), tindakan positif (77,14%), dan motivasi berhenti tinggi (84,76%). Hubungan signifikan secara statistik ditemukan antara motivasi berhenti dengan pengetahuan (p=0,045; OR=4,89), sikap (p=0,037; OR=5,23), dan tindakan (p=0,044; OR=2,87). Ketiga komponen perilaku berhubungan signifikan dengan motivasi berhenti merokok. Sikap menunjukkan hubungan terkuat, mengindikasikan bahwa program berhenti merokok berbasis kampus perlu memprioritaskan strategi modifikasi sikap seperti motivational interviewing dan kelompok dukungan sebaya, dilengkapi pelatihan keterampilan perilaku dan kebijakan kampus bebas asap rokok.

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INTRODUCTION

Tobacco consumption remains a critical public health challenge in the Southeast Asian region, with profound epidemiological implications, particularly among young populations. In 2021, the ASEAN region recorded an estimated 137 million smokers, with a substantial gender disparity in prevalence (48.7% among males versus 4.7% among females). Despite a decline in smoking prevalence in most countries since 1990, the absolute number of smokers has paradoxically increased by 63.3% as a consequence of regional demographic growth, indicating that tobacco denormalization efforts have not kept pace with population expansion. The heterogeneity across ASEAN member states is considerable, with tobacco-attributable mortality ranging from 68.9 to 364 per 100,000 population, reflecting substantial differences in tobacco control policy effectiveness and healthcare system capacity (Dai et al., 2025). These epidemiological patterns underscore the urgency of targeted intervention strategies, particularly among youth and young adult populations, where smoking initiation and the consolidation of addictive behaviors typically occur (Kaur et al., 2024).

Indonesia presents a particularly concerning profile within the ASEAN context. Among adolescents aged 10 to 14 years, smoking prevalence stands at 2.0%, with early initiation rates reaching as high as 3.2% in certain provinces such as Papua approximately 30 times the national average. Regional disparities are notable, with West Sumatra (13.6%) and South Sulawesi (10.0%) exceeding the national average of 9.6% in this age group (Deva et al., 2025). In South Sulawesi specifically, the prevalence of active smokers (24 – 25%) aligns with the Southeast Asian average for adolescent and young adult cohorts (Xing et al., 2022). Epidemiological monitoring in South Sulawesi revealed a near-stagnant trend, with prevalence declining marginally from 25.59% (2019) to 24.89% (2020) before slightly increasing to 24.91% (2021), suggesting that the current public health burden has not been meaningfully reduced despite intervention efforts (Arni et al., 2023).

University students represent a particularly vulnerable population for initiating and sustaining smoking behaviors, influenced by the interplay of newfound autonomy, peer pressure, and the normalization of tobacco use in campus environments (Arni et al., 2023). Engineering faculties present additional risk factors that may exacerbate smoking behavior: a predominantly male student composition, high academic workloads that generate chronic stress, a masculine occupational culture that normalizes smoking as a coping mechanism, and strong peer group cohesion that facilitates the social contagion of smoking behaviors. Principal barriers to smoking cessation among students include time constraints, financial limitations, low self-efficacy, and prevailing social norms that sanction smoking (Kim et al., 2024). Conversely, factors supporting successful cessation include accessible and flexible programs, peer support, positive prior cessation experiences, and digital health technologies such as mobile applications (Arni et al., 2023). Motivation-based interventions, counseling approaches, and cognitive dissonance strategies have demonstrated efficacy in increasing smoking cessation rates, with abstinence rates of 21 – 38% within six months among college students (Hamidi, Syahda and Apriyanti, 2025).

The motivation to quit smoking among university students is shaped by a combination of internal factors (attitudes, self-efficacy, and knowledge) and external factors (peer influence, social support, and environmental cues). This study draws upon two complementary theoretical frameworks. The Health Belief Model (HBM) posits that health behavior is determined by perceived susceptibility, perceived severity, perceived benefits, and perceived barriers, all of which are informed by an individual's health knowledge (Augeraud-Véron & Leandri, 2024). The Theory of Planned Behavior (TPB) emphasizes that behavioral intention is shaped by attitudes toward the behavior, subjective norms, and perceived behavioral control (Chen et al., 2025). In the context of smoking cessation, these frameworks suggest that knowledge shapes perceptions of health threats (HBM), attitudes and perceived control influence behavioral intention (TPB), and actual cessation actions reflect the operationalization of these cognitive and evaluative processes. However, the specific interrelationships between these

behavioral components and cessation motivation among Indonesian university students remain insufficiently explored (Fauzia & Handayani, 2022).

An initial survey at Universitas Pejuang Republik Indonesia (UPRI) identified 320 active smoking students, with the Faculty of Engineering exhibiting the highest smoking prevalence, attributable to its predominantly male student demographic. This study employs a cross-sectional analytical approach to examine the relationship between smoking-related knowledge, attitudes, and actions and motivation to quit smoking among engineering students at UPRI. By quantifying these associations, the study aims to provide empirical evidence for the development of targeted, comprehensive smoking cessation programs tailored to the university student population in Indonesia.

METHOD

Study Design

This study employed an analytical observational design with a cross-sectional approach to examine the prevalence of, and associations between, smoking-related behavioral variables (knowledge, attitudes, and actions) and motivation to quit smoking at a single point in time.

Setting and Period

The study was conducted at the Faculty of Engineering, Universitas Pejuang Republik Indonesia, Makassar, South Sulawesi, Indonesia, during March–April 2024. This setting was selected due to the high prevalence of smoking among its students and the accessibility of the target population.

Population and Sample

The study population comprised 135 active smoking students enrolled at the Faculty of Engineering. The minimum sample size was calculated using the Lemeshow formula for cross-sectional studies (95% confidence level, 5% margin of error), yielding a requirement of 100 respondents. A total of 105 respondents were recruited, representing 77.8% of the total population. Although the sample proportion approached the total population, purposive sampling was employed rather than total sampling to ensure that all participants met specific eligibility criteria critical to data quality and to accommodate practical constraints during data collection.

Inclusion criteria encompassed: (a) currently enrolled active students in the Faculty of Engineering; (b) current smokers defined as consuming at least one cigarette per day for the preceding month; (c) aged 18 years or older; and (d) voluntary willingness to participate with informed consent. Exclusion criteria included: (a) students with documented severe mental health conditions potentially affecting questionnaire comprehension; and (b) students absent during the data collection period. The purposive approach was specifically employed to operationalize the ‘current smoker’ criterion, which required active verification of daily smoking behavior rather than reliance on administrative records alone.

Data Collection

Data were collected using a researcher-developed structured questionnaire designed based on the theoretical constructs of the Health Belief Model and the Theory of Planned Behavior. The instrument comprised five sections: (1) demographic characteristics, (2) knowledge about smoking and its health impacts (10 items), (3) attitudes toward smoking cessation (10 items), (4) smoking-related actions and behaviors (10 items), and (5) motivation to quit smoking (10 items). All substantive items utilized a four-point Likert scale format.

The questionnaire underwent content validity assessment by three subject matter experts in public health and was subsequently pilot-tested on 30 students outside the study sample at the same university. Validity testing employed Pearson product–moment correlation (r-count > r-table at α=0.05), and reliability was assessed using Cronbach’s alpha, yielding coefficients ranging from 0.78 to 0.85 across the four domains, indicating good internal consistency.

Data collection was conducted through guided questionnaire administration, whereby trained research assistants were present to provide standardized instructions and clarification as needed, while respondents completed the questionnaire independently. This approach ensured uniformity in comprehension without introducing interviewer bias. Participants received a briefing on research

objectives, confidentiality assurances, and informed consent procedures prior to participation. The average completion time was 20 – 25 minutes.

Operational Definitions

Variables were operationally defined and dichotomized using a 60% cutoff point, in accordance with the categorization criteria proposed by Arikunto (2019), which classifies scores ≥60% of the maximum as 'good/positive/high' and scores <60% as 'poor/negative/low'. The variables were defined as follows: (1) Knowledge: understanding of smoking hazards and health impacts, categorized as 'good' (≥60%) or 'poor' (<60%); (2) Attitudes: beliefs and perceptions regarding smoking cessation, categorized as 'positive' (≥60%) or 'negative' (<60%); (3) Actions: actual behaviors related to smoking cessation attempts, categorized as 'positive' (≥60%) or 'negative' (<60%); and (4) Motivation to Quit: level of readiness and desire to cease smoking, categorized as 'high' (≥60%) or 'low' (<60%).

Data Analysis and Processing

Data were analyzed using IBM SPSS Statistics version 26.0 in two stages. Univariate analysis described frequency distributions and percentages for all study variables. Bivariate analysis employed chi-square tests to examine associations between independent variables (knowledge, attitudes, and actions) and the dependent variable (motivation to quit smoking), with a significance threshold of α=0.05. Fisher's exact test was utilized when expected cell counts fell below five. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to quantify the strength of associations, where OR >1 indicates increased likelihood and CI excluding 1.0 confirms statistical significance.

Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Committee of the Health Polytechnic of Makassar (Approval No: 0708/M/KEPK-PTKMS/V/2024). All participants provided written informed consent after receiving detailed information regarding research objectives, procedures, risks, benefits, and their right to withdraw without consequence. Participant confidentiality and data anonymity were maintained throughout the study, with all data stored securely and accessible exclusively to the research team.

RESULT

The results are presented sequentially, beginning with the univariate distribution of study variables, followed by the bivariate analysis examining associations with motivation to quit smoking.

Univariate Analysis

Table 1. Distribution of Respondents Based on Study Variables (N=105)

Variable	Category	Frequency (n)	Percentage (%)
Knowledge Level	Good	101	96.19
	Poor	4	3.81
Attitudes	Positive	97	92.38
	Negative	8	7.62
Actions	Positive	81	77.14
	Negative	24	22.86
Motivation to Quit	High	89	84.76
	Low	16	15.24

Source: Primary Data, 2024

Table 1 reveals that the overwhelming majority of respondents demonstrated favorable profiles across all study variables. Knowledge and attitudes exhibited the highest positive proportions, with over 90% of respondents scoring in the 'good' and 'positive' categories, respectively. Actions showed a comparatively lower positive proportion, suggesting a progressive attenuation from cognitive and attitudinal readiness to actual behavioral engagement. Most respondents reported high motivation to quit smoking.

Bivariate analysis

Table 2. Relationship Between Knowledge Level and Motivation to Quit Smoking (N=105)

Variable	Category	High Motivation		Low Motivation		Total	p-value	OR (95% CI)	X^2
		n	%	n	%				
Knowledge	Good	88	87.13	13	12.87	101	**0.045***	4.89 (1.12 – 21.34)	5.693
	Poor	1	25.00	3	75.00	4			
Attitudes	Positive	85	87.63	12	12.37	97	**0.037***	5.23 (1.34 – 20.41)	6.023
	Negative	4	50.00	4	50.00	8			
Actions	Positive	72	88.89	9	11.11	81	**0.044***	2.87 (1.08 – 7.63)	4.144
	Negative	17	70.83	7	29.17	24			

*Note: *p<0.05; Fisher's exact test applied for Knowledge and Attitudes variables due to expected cell counts <5*

Source: Primary Data, 2024

Table 2 presents the consolidated bivariate analysis. All three independent variables demonstrated statistically significant associations with motivation to quit smoking. Attitudes exhibited the strongest association, followed by knowledge and actions. For the knowledge and attitudes variables, Fisher's exact test was employed as the primary inferential statistic due to the presence of expected cell counts below five in the contingency tables, which is an inherent consequence of the small number of respondents in the 'poor knowledge' (n=4) and 'negative attitudes' (n=8) categories. All confidence intervals excluded 1.0, confirming the statistical significance of these associations.

DISCUSSION

This study investigated the relationship between three behavioral components knowledge, attitudes, and actions and smoking cessation motivation among engineering students. The findings consistently demonstrate significant positive associations across all three domains, providing empirical support for multi-component cessation interventions. The following discussion interprets these findings within the theoretical frameworks of the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB) and contextualizes them against existing literature.

Knowledge and Motivation to Quit Smoking

The exceptionally high proportion of respondents with good knowledge (96.19%) is a noteworthy finding that may be partially attributable to the characteristics of engineering students. As students in a tertiary scientific discipline, these respondents likely possess strong analytical thinking skills and systematic information-processing habits, which facilitate the acquisition and retention of health-related knowledge from diverse sources, including digital media, campus health campaigns, and academic curricula. Furthermore, engineering students' familiarity with evidence-based reasoning may predispose them to accept scientific evidence regarding smoking hazards more readily than peers in non-scientific fields.

Within the HBM framework, this finding aligns with the constructs of perceived susceptibility and perceived severity: comprehensive knowledge of smoking's health consequences heightens individuals' perceptions of personal vulnerability to tobacco-related diseases and the severity of those outcomes, thereby increasing motivational readiness for cessation (Augeraud-Véron & Leandri, 2024; Pribadi & Devy, 2020). The significant association observed (p=0.045; OR=4.89) corroborates findings by (Rahmawati et al., 2025), who documented a strong positive correlation between knowledge and cessation desire among Indonesian university students (p=0.000; r=0.602). Similarly, (Nagy-Pénzes et al., 2022) demonstrated that knowledge-enhancing school interventions promoted health-protective behaviors, although the translation to actual smoking cessation was not always statistically significant.

However, the discrepancy between nearly universal good knowledge (96.19%) and the lower proportion of high cessation motivation (84.76%) underscores a critical insight: knowledge constitutes a necessary but insufficient condition for behavioral change. This knowledge action gap is well documented in health behavior literature and suggests that cognitive awareness alone cannot overcome

the physiological, psychological, and social barriers to smoking cessation. It is important to note that the wide confidence interval for the knowledge–motivation association (95% CI: 1.12–21.34) reflects limited statistical precision, attributable to the very small number of respondents with poor knowledge (n=4). While the direction and significance of this association are reliable, the precise magnitude of effect should be interpreted with caution, and future studies with larger proportions of low-knowledge respondents are warranted to refine this estimate.

Attitudes and Motivation to Quit Smoking

Attitudes demonstrated the strongest association with cessation motivation among the three behavioral variables (OR=5.23; p=0.037), a finding that carries important theoretical implications. Within the TPB framework, attitudes toward a behavior comprising both affective responses (emotional evaluations) and instrumental beliefs (cognitive assessments of outcomes) serve as primary determinants of behavioral intention. The strength of this association suggests that, in this population, the evaluative and emotional dimensions of smoking cessation may exert greater influence on motivational readiness than purely cognitive (knowledge-based) factors.

This finding is consistent with previous research demonstrating the primacy of attitudes in shaping cessation intentions. (Ambarwati et al., 2025) confirmed that positive attitudes, moderated by subjective norms and perceived behavioral control, explain substantial variance in smoking cessation intentions. (Fauzia & Handayani, 2022) reported that engineering students with positive attitudes were nearly ten times more likely to exhibit cessation motivation (OR=9.8; p=0.000), while (Korengkeng & Tambalean, 2023) documented a very strong correlation between attitudes and cessation desire among adolescents (r=0.803; p=0.000). The consistently strong effect sizes across these studies reinforce the centrality of attitudinal modification in cessation programming.

Despite the high prevalence of positive attitudes (92.38%), the attitude behavior gap remains an important consideration. This discrepancy reflects the multifactorial nature of smoking cessation: nicotine dependence, withdrawal symptoms, low stress tolerance, permissive social norms, and environmental triggers collectively impede the translation of positive attitudes into sustained abstinence behavior (Wang et al., 2023). Similar to the knowledge variable, the confidence interval for the attitude motivation OR was relatively wide (95% CI: 1.34–20.41), attributable to the small number of respondents with negative attitudes (n=8). This statistical imprecision, while not invalidating the finding, warrants acknowledgment as a limitation that future adequately powered studies should address.

Actions and Motivation to Quit Smoking

The comparatively lower proportion of positive actions (77.14%) relative to good knowledge and positive attitudes reveals a progressive attenuation along the behavioral cascade, a pattern consistent with health behavior models that recognize behavioral implementation as the most challenging stage of change. The significant but moderate association between actions and motivation (OR=2.87; p=0.044) suggests a bidirectional relationship: initial motivation may catalyze early cessation actions (such as reducing consumption or avoiding smoking contexts), while successful execution of these actions reciprocally strengthens motivation through enhanced self-efficacy and positive outcome experiences.

This finding aligns with (Chen et al., 2025), who demonstrated that perceived behavioral control a core TPB construct reinforces the influence of attitudes and social norms on cessation intentions. Within the HBM framework, the action-motivation relationship reflects the perceived benefits construct: individuals who have initiated positive cessation-related actions experience tangible benefits (improved breathing, financial savings, social approval), which in turn reduce perceived barriers and strengthen the motivation to persist. The narrower confidence interval for actions (95% CI: 1.08–7.63) compared to knowledge and attitudes reflects the more balanced distribution of respondents across categories, yielding a more precise estimate of effect size.

Integration of Findings and Theoretical Implications

The hierarchical pattern of association strengths with attitudes (OR=5.23) exceeding knowledge (OR=4.89) and actions (OR=2.87) offers a nuanced understanding of cessation motivation dynamics. This pattern suggests that the TPB may provide a more explanatory framework than the HBM for understanding cessation motivation in this population, as the attitudinal construct (central to TPB)

demonstrated the strongest predictive capacity. However, the significance of knowledge (aligned with HBM's perceived susceptibility/severity constructs) indicates that both frameworks contribute complementarily to explaining cessation motivation.

From the authors' scientific perspective, these findings suggest that the cognitive affective behavioral pathway to cessation motivation is not linear but rather synergistic. Engineering students in this study may possess a unique motivational profile shaped by their analytical orientation (facilitating knowledge acquisition) and critical thinking capacity (enabling attitude formation), yet face distinctive barriers in translating these cognitive and evaluative advantages into sustained cessation behavior particularly given the engineering faculty's social environment, where masculine norms and peer cohesion may reinforce smoking as a social bonding mechanism. This interpretation implies that effective cessation programs for this population should address not only individual-level behavioral components but also the socio-environmental factors endemic to engineering academic culture.

The practical implications are threefold. First, given that attitudes showed the strongest association, university-based cessation programs should prioritize attitude modification strategies, including motivational interviewing, decisional balance exercises, value clarification activities, and testimonials from successful quitters. Second, despite high knowledge levels, the knowledge action gap suggests that information provision alone is insufficient; programs should incorporate skills training for coping with cravings, relapse prevention techniques, and access to cessation aids such as nicotine replacement therapy and counseling services. Third, the moderate prevalence of positive actions highlights the need for structural interventions smoke-free campus policies, designated smoking cessation support spaces, and peer support groups that facilitate the translation of motivation into sustained behavioral change (Setchoduk et al., 2023).

Strengths and Limitations

This study offers several methodological strengths: a robust analytical approach employing both univariate and bivariate analyses with odds ratio quantification; an adequate sample size (n=105) exceeding the minimum statistical power requirement; and the use of a validated and reliable instrument (Cronbach's alpha 0.78–0.85). The explicit integration of dual theoretical frameworks (HBM and TPB) strengthens the interpretive depth of the findings.

However, several limitations warrant acknowledgment. First, the cross-sectional design precludes causal inference regarding the directionality of observed associations; longitudinal research is required to establish temporal sequences. Second, the study was conducted at a single university's engineering faculty, limiting generalizability to other academic disciplines, institutions, or geographic contexts. Third, self-report data are susceptible to social desirability and recall biases; future studies should consider incorporating biochemical validation (e.g., cotinine testing). Fourth, wide confidence intervals for the knowledge and attitude variables attributable to small cell counts in the contingency tables indicate limited precision in estimating exact effect magnitudes. Fifth, the study measured cessation motivation rather than actual quit attempts or sustained abstinence, representing a more distal outcome. Future research should track actual cessation behavior over time to assess the translation of motivation into behavioral outcomes.

CONCLUSION AND SUGGESTION

This study demonstrates that smoking-related knowledge, attitudes, and actions are each significantly and positively associated with cessation motivation among engineering students. Among the three behavioral components, attitudes emerged as the strongest correlate of cessation motivation, followed by knowledge and actions. This hierarchical pattern suggests that the evaluative and emotional dimensions of smoking cessation exert a more potent influence on motivational readiness than cognitive understanding or behavioral engagement alone.

Given that the respondent population already possessed overwhelmingly high levels of health knowledge, the primary programmatic implication is not to further intensify educational efforts regarding smoking hazards but rather to invest in strategies that strengthen cessation attitudes and facilitate behavioral implementation. University health services and student affairs divisions should consider developing multi-component cessation programs that incorporate motivational interviewing to resolve ambivalence about quitting, peer support groups that leverage the strong group cohesion

characteristic of engineering faculties, behavioral skills training for managing cravings and high-risk social situations, and structural modifications such as smoke-free campus policies that reduce environmental smoking cues. Addressing socio-cultural dimensions specific to engineering academic environments including masculine norms and stress-related smoking, may further enhance program effectiveness.

Future research should employ longitudinal designs to establish causal pathways between behavioral components and cessation outcomes, incorporate multi-site sampling across diverse faculties to enhance generalizability, and include biochemical validation of self-reported smoking status. Intervention studies testing the comparative effectiveness of attitude-focused versus behavior-focused cessation strategies within the university setting would provide actionable evidence for program optimization.

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