Original Article

Predictors of Sustained Six Months Quitting Success: Efforts of Smoking Cessation in Low Intensity Smoke-Free Workplaces

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Abstract

Introduction: This study aims to identify the predictors of a 6-month quitting success among employees involved in workplace smoking cessation with low-intensity smoke-free policy. Materials and Methods: A multicentre prospective cohort study was conducted among employees from 2 different public universities in Malaysia. Interventions include at least 2 sessions of behavioural therapy combined with free nicotine replacement therapy (NRT) for 8 weeks. Participants were followed up for 6 months. Independent variables assessed were on sociodemographic and environmental tobacco smoke. Their quit status were determined at 1 week, 3 months and 6 months. Results: One hundred and eighty-five smokers volunteered to participate. Among the participants, 15% and 13% sustained quit at 3 months and 6 months respectively. Multivariate analysis revealed that at 6 months, attending all 3 behavioural sessions predicted success. None of the environmental tobacco exposure variables were predictive of sustained cessation. Conclusion: Individual predictors of success in intra-workplace smoking cessation programmes do not differ from the conventional clinic-based smoking cessation. Furthermore, environmental tobacco exposure in low intensity smoke-free workplaces has limited influence on smokers who succeeded in maintaining 6 months quitting.

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Key words: Environmental tobacco smoke, Smoking cessation, Workplace

Introduction

Of the world's 1.25 billion adult smokers, 10% (about 125.8 million) reside within Southeast Asian countries. The smoking prevalence of daily smoking adults (above 18 years old) in this region ranged from 14.3% in Singapore to 40% in Laos, with Malaysia recording 21% among adults.[1,2] Interventions to reduce smoking rates have had little impact in Malaysia, with only 2% of reduction in smoking prevalence over a 10-year period (21.5% in 2006, from a previous prevalence of 23.5% in 1996).[3] This is despite the fact that Malaysia has rectified the World Health Organisation (WHO) Framework Convention on Tobacco Control (FCTC) since the year 2003.[4] According to the FCTC, all signatories must follow stated guidelines regarding tobacco control within a 5-year time span.[5] This includes the enforcement of smoke-free policies at the workplaces and universities.

Introduction of a smoke-free workplace policy has been considered to contribute significantly to smoking cessation in Western societies[6] or developed countries.[7] Nonetheless, in developing countries with high smoking prevalence[8] and with a high proportion of society with poor quitting motivation,[9,10] such as Malaysia, the impact of smoke-free policy remains uncertain. One way to measure smoke-free policy success is by measuring the perceived existence of environmental tobacco smoke (ETS) (i.e. exposure to other people's smoking) in the workplace environment.[11,12]

Besides workplace smoke-free policy, another pertinent factor that contributes to success in quitting is individual

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characteristics. Success in quitting is associated with an older age of smoking initiation[13] and a history of previous quit attempts, higher nicotine dependence[14] and nicotine replacement therapy (NRT) adherence.[15] Nonetheless, these were mainly self-supported efforts in the conventional smoking cessation clinics, with very few concentrating on programmes conducted in the workplaces. The results for such populations may be skewed, as smokers attending workplace programmes tend to be less motivated smokers, due to enforcement of attendance from the top management.[16] Hence, the identification of client characteristics that predict success important, as this information could match smokers with a workplace strategy that is most effective in helping them quit. In this study, we assess the cessation results of our 6-month workplace smoking cessation programme and identify predictors of quitting success, which includes workplace tobacco exposure. We hypothesise that in workplaces with smoke-free policy, the environmental tobacco exposure will not be a significant predictor of smoking abstinence rates.

Materials and Methods

A prospective cohort study was conducted. Data were collected between November 2009 and November 2010 in University A, and between March 2010 and March 2011 in University B. Both public universities from where the study was conducted have smoke-free policies in place since 2008. Such policies include penalties for smoking of up to US$50 per offence, anti-smoking campaigns and road shows. Nonetheless, implementation of the policy was rather loose. For example, smokers who were caught smoking in the campus, were merely given multiple warnings without stern actions taken.

Hence, in complementing the smoke-free policy in accordance to FCTC, the researchers introduced the first workplace smoking cessation services in the 2 universities. This was specifically targeting staff members. Student centres and a student college were used as temporary sites for the universities' non-clinic-based smoking cessation programmes. Ethical approval was given for the study by the University of Malaya, which had full support from the management and unions of both universities. Informed consent was obtained from all participants.

This study used convenient sampling, whereby smokers from both universities who were interested in quitting were invited to enrol in the study. Invitations were issued through the staff portal, staff email, posters, main university websites and invitation letters through the Head of Department/Unit. Eligible participants were daily cigarette smokers (for at least the past 12 months). They had to be able to communicate in either Bahasa Malaysia (the national language) or English. Participants were excluded if they had any contraindications to nicotine replacement therapy such as a recent myocardial infarction, life-threatening arrhythmias, severe or worsening angina, or allergy to any component of the medication. A total of 185 participants agreed to participate in this research.

Smoking Cessation Treatment Methods

Treatment consisted of combined medical and cognitive behavioural therapy (CBT). To standardise treatments, similar programmes were conducted in both universities. All sessions were conducted by one medical officer and an assistant covering both universities. Medical treatment consisted of nicotine replacement therapy (NRT) gums/patch, depending on the patients' medical history and degree of nicotine dependence. NRT was supplied for a maximum period of 2 months, depending on participants' requirements. Participants were also supplied with a diary where they were required to quantify the amount of cigarettes they smoked daily.

The NRT were supplied during the CBT sessions. CBT involved at least 2, twice-weekly counselling sessions provided by the same medical officer, who had undergone one month training in the area. The sessions covered coping strategies, risks and benefits of quitting, relapse prevention, stress reduction and weight control. The questionnaires utilised in this study were self-administered during the counseling sessions prior to treatment.

Assessment Methods

Sociodemographic and Smoking History: Sociodemographic information was gathered via questionnaire administration. Data gathered included age group, education level, occupational status and marital status. Information on smoking history gathered included number of cigarettes/day, age at which the participant began smoking and previous quitting attempts within the past year.

Environmental Tobacco Exposures: Environmental influences may also affect smoking cessation[11] when smokers are exposed to Environmental Tobacco Smoke (ETS). The questionnaire used here was adapted from a path analysis study.[11] It consisted of 3 simple questions and was meant to examine the influence of worksite environment, home environment and peer smoking on smoking cessation. This is based on the hours of exposure at home and work by other people smoking within the past 7 days, and the number smoking colleagues at work. Notably, in the study from which this questionnaire was adapted, a Likert scale was used. The questionnaire was translated into Malay language for appropriate language suitability.[17] Back-to-back translation and reliability tests

by 3 independent language translators were performed on a group of 40 smokers. Reliability tests revealed Cronbach's alpha of between 0.80 and 0.83 and correlations of between 0.5 and 0.8.

Reported Abstinence and Quitting Confirmation: Abstinence was determined during the first 2 months of follow-up during counselling sessions and from the diaries. The information on quitting was also collected at 3 and 6 months post-treatment via telephone calls. Smoking abstinence was confirmed by a carbon monoxide (CO) reading of <6 ppm using Mini Smokerlyzer (Bedfont Scientific Ltd, Rochester, England) during follow-up. The ex-smokers were visited by the researcher at their work office after 2 months of follow-up for measurements. Quitters were smokers who had achieved prolonged abstinence (did not smoke even a single cigarette) from the initial quit date until the time of assessment. Point abstinence is referred to 7- day quit duration. Subjects who could not be contacted or who did not come for subsequent counselling (refused, changed phone number, could not be contacted or intentionally gave the wrong telephone numbers) were considered to have continued smoking.

Data Analysis

Data management and statistical analysis were performed with SPSS 15.0. A value of $P < 0.05$ was taken as a statistically significant level. Univariate logistic regression was performed to assess the relationship between each variable and abstinence at 1 week, 3 months and 6 months. Multiple logistic regression models for cigarettes/day and previous cessation attempts was performed adjusting for socio demographic variables, NRT and clinic sessions. Each model was checked for fit by the Hosmer-Lemeshow goodness-of-fit test.

Results

There were 185 participants in total, 138 from University A and 47 from University B. All participants answered the questionnaires on sociodemographic and smoking behaviour prior to the treatment programme. Forty percent (n = 74) of the smokers attended only one initial session, 32% (n = 59) attended 2 sessions within 2 weeks and 28% (n = 52) attended 3 sessions. Smoking status was determined among 100% participants at 1 week, and 90% (n = 166) at 6 months. Participants who could not be contacted were considered as smokers. Follow-up rates at 3 and 6 months were 65% and 90% respectively. Defaulters at 3 months compared to non-defaulters were more likely to have only attended one session ($P < 0.05$) and were more likely to be professional workers ($P < 0.05$). No significant differences were observed with regard to all other baseline results at
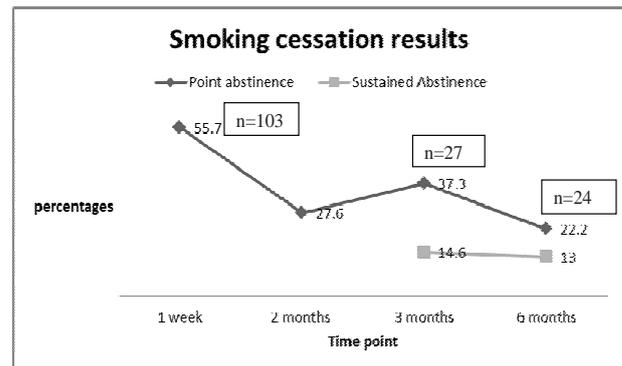
Fig. 1. Smoking cessation results for point and sustained abstinence.

6 months.

All subjects were male with a mean (SD) age of 35.9 (10.9) years. In terms of education attainment, 3% had only completed elementary school, 58% had completed both primary and secondary school and 39.3% had attended college. Most of the participants were from Malay ethnic group (95%), while 10 others were of different ethnic group e.g. Indian. The majority (93%) of participants were support staff (e.g. technical workers, clerical workers and labourers), while 7% were in the professional group. Sociodemographic background and sociodemographic characteristics of participants in the 2 public universities were similar (all $P > 0.05$).

On average, participants reported that they started smoking at the mean age of 17 years (range, 9 to 42). The average number of cigarettes smoked per day was 14 (range, 2 to 40). The majority (85%) had one or more quit attempts, while 15% had never attempted to quit smoking.

Abstinence (Point Abstinence and Sustained Abstinence)

Of the participants included in the study, 103/185 (55.7%) smokers continued to abstain from smoking at 1 week. The
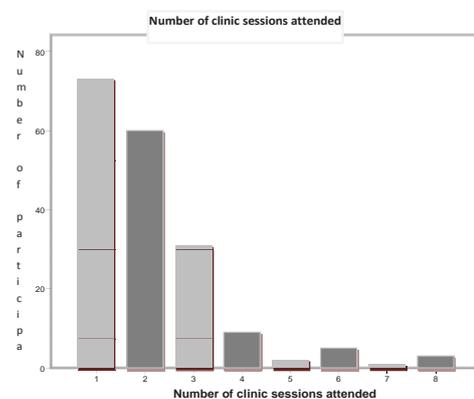

Fig. 2. Number of clinic sessions attended by participants.

number of smokers who sustained abstinence (i.e. never relapse since quitting), was reduced from 27/185 (14.6%) participants at 3 months to 24/185 (13.0%) by the end of 6 months (Fig. 2).

Univariate Predictors of Sustained Abstinence at 1 week, 3 months and 6 months

Smokers who had attended more than one session were significantly more likely to quit at week 1. At 3 months and

Table 1. Adjusted Analysis of Potential Predictors of 1 Week Abstinence, 3 Months Sustained Abstinence and 6 Months Sustained Abstinence Sociodemograhic, Smoking History and Follow-up Results of Point Abstinence at 6 months

Variables	Quit for 1 week n (%)	Quit for 1 week [a] OR (95% CI)	Sustained cessation for 3 months n (%)	Sustained cessation for 3 months[a] OR (95% CI)	Sustained cessation for 6 months n (%)	Sustained cessation for 6 months[a] OR (95%CI)
Sociodemographic						
Age group (years)						
18 to 30	45 (43.7)	Ref	9 (33.3)	Ref	7 (29.2)	Ref
31 to 40	26 (25.2)	1.05 (0.41 – 2.66)	4 (14.8)	0.36 (0.08 – 1.69)	4 (16.7)	0.74 (0.19 – 2.83)
41 to 50	23 (22.3)	0.48 (0.18 – 1.31)	9 (33.3)	1.94 (0.55 – 6.88)	8 (33.3)	1.51 (0.46 – 4.93)
51 and above	9 (8.7)	0.38 (0.11 – 1.29)	5 (18.5)	1.53 (0.35 – 6.68)	5 (20.8)	2.06 (0.54 – 7.84)
Education level						
Primary school	4 (3.9)	Ref	1 (3.7)	Ref	2 (8.7)	Ref
Secondary school	58 (56.3)	NA	15 (55.6)	1.20 (0.09 – 15.59)	13 (56.5)	0.29 (0.04 – 2.14)
Diploma and above	41 (39.8)	NA	11 (40.7)	1.17 (0.09 – 15.89)	8 (34.8)	0.33 (0.04 – 2.46)
Occupational status						
Support group	95 (92.2)	Ref	25 (92.6)	Ref	22 (95.7)	Ref
Professionals	8 (7.8)	2.42 (0.56 – 10.54)	2 (7.4)	0.88 (0.15 – 5.04)	1 (4.3)	1.19 (0.22 – 6.55)
Marital status						
Non-married	37 (35.9)	Ref	5 (18.5)	Ref	5 (20.8)	Ref
Married	66 (64.1)	1.70 (0.76 – 3.9)	22 (81.5)	3.26 (0.9 – 11.74)	18 (79.2)	1.96 (0.51 – 1.73)
Ethnic group						
Malay	97 (94.2)	Ref	24 (88.9)	Ref	21 (87.5)	Ref
Non-Malay	6 (5.8)	1.99 (0.40 – 10.02)	3 (11.1)	16.75 (2.10 – 133.74)†	3 (12.5)	6.27 (1.13 – 34.89)*
Smoking history						
Number of cigarettes/day						
<10	14 (13.6)	Ref	5 (18.5)	Ref	4 (17.4)	Ref
≥10	89 (86.4)	1.55 (0.58 – 4.13)	22 (81.5)	0.78 (0.20 – 3.05)	19 (82.6)	0.68 (0.19 – 2.41)
Age of smoking initiation (years)						
8 to 12	8 (7.8)	Ref	2 (7.4)	Ref	1 (4.3)	Ref
13 to 18	72 (69.9)	1.19 (0.35 – 4.04)	19 (70.4)	1.65 (0.27 – 10.03)	16 (69.6)	1.99 (0.23 – 17.31)
19 and above	23 (22.3)	0.63 (0.16 – 2.45)	6 (22.2)	0.23 (0.22 – 6.76)	6 (26.1)	1.60 (0.16 – 15.59)
Previous quit attempts within past year						
0	14 (13.6)	Ref	5 (18.5)	Ref	6 (26.1)	Ref
≥1	89 (86.4)	1.70 (0.59 – 4.90)	22 (81.5)	0.65 (0.17 – 2.55)	17 (73.9)	0.45 (0.15 – 1.37)
Follow-up variables						
NRT adherence						
Adherent	70 (68.0)	Ref	22 (81.5)	Ref	19 (79.2)	Ref
Non-adherent	33 (32.0)	5.99 (0.61 – 58.62)	5 (18.5)	2.27 (0.15 – 35.47)	5 (20.8)	2.99 (0.25 – 35.28)
Number of counselling sessions attended						
1	30 (29.1)	Ref	4 (14.8)	Ref	4 (16.7)	Ref
2	48 (46.6)	9.13 (0.94 – 88.70)	8 (29.7)	9.10 (0.65 – 127.70)	9 (37.5)	15.44 (1.12 – 212.59)*
3	15 (14.6)	2.23 (0.19 – 25.34)	13 (48.1)	55.11	8 (33.3)	41.99 (2.10 – 84.18)*
4 or more	10 (9.7)	2.21 (0.19 – 26.41)	2 (7.4)	(2.83 – 1073.54)* 5.55 (0.22 – 140.22)	3 (12.5)	10.46 (0.49 – 224.32)

Table 1. (Con't) Adjusted Analysis of Potential Predictors of 1 Week Abstinence, 3 Months Sustained Abstinence and 6 Months Sustained Abstinence Sociodemograhic, Smoking History and Follow-up Results of Point Abstinence at 6 months

Variables	Quit for 1 week n (%)	Quit for 1 week [a] OR (95% CI)	Sustained cessation for 3 months n (%)	Sustained cessation for 3 months[a] OR (95% CI)	Sustained cessation for 6 months n (%)	Sustained cessation for 6 months[a] OR (95%CI)
Smoking environment						
Aware of the university smoking prohibition rule						
Yes	97 (94.2)	Ref	25 (92.6)	Ref	22 (91.7)	Ref
No	6 (5.8)	2.05 (0.39 – 10.84)	2 (7.4)	1.30 (0.17 – 9.87)	2 (8.3)	2.14 (0.37 – 12.34)
Smokes on the university campus						
Yes	76 (73.8)	Ref	22 (81.5)	Ref	20 (83.3)	Ref
No	27 (26.2)	1.50 (0.63 – 3.57)	5 (18.5)	0.98 (0.27 – 3.49)	4 (16.7)	0.79 (0.24 – 2.59)
Smoking exposure						
Worksite environment (hours)						
0	6 (5.9)	Ref	1 (3.7)	Ref	1 (4.2)	Ref
1 to 2	39 (38.2)	3.59 (0.88 – 14.69)	4 (14.8)	0.81 (0.07 – 9.26)	5 (20.8)	1.09 (0.11 – 10.85)
3 to 8	35 (34.3)	1.92 (0.47 – 7.80)	12 (44.4)	1.89 (0.19 – 19.00)	12 (50.0)	2.31 (0.26 – 20.82)
9 or more	22 (21.6)	2.63 (0.59 – 11.81)	10 (37.0)	2.62 (0.25 – 27.41)	6 (25.0)	2.03 (0.21 – 19.73)
Home environment (hours)						
0	49 (47.6)	Ref	12 (44.4)	Ref	11 (45.8)	Ref
1 to 4	37 (35.9)	1.56 (0.67 – 3.64)	9 (33.3)	0.89 (0.27 – 2.92)	8 (33.3)	0.93 (0.32 – 2.69)
5 to 14	10 (9.7)	0.68 (0.22 – 2.14)	3 (11.1)	2.29 (0.48 – 11.00)	3 (12.5)	1.56 (0.36 – 6.68)
15 or more	7 (6.8)	2.63 (0.52 – 13.30)	3 (11.1)	1.82 (0.31 – 10.73)	2 (8.3)	1.58 (0.28 – 8.99)
Peer influence						
None	2 (1.9)	Ref	0 (0)	Ref	0 (0)	Ref
Very few	6 (5.8)	NA	2 (7.4)	NA	3 (12.5)	NA
Less than half	14 (13.6)	NA	4 (14.8)	NA	5 (20.8)	NA
Most are smokers	81 (78.6)	NA	21 (77.8)	NA	16 (66.7)	NA

[a]Adjusted for all the variables in the socio demographic, smoking history and follow-up variables

* P <0.05; † P <0.01

NA; One of the group has 0% quit rate, OR cannot be computed.

6 months, attendance at more clinic sessions had an odds ratio of 7.0 and 8.0 for the likelihood of quitting. It was also shown that being non-Malay increased the chances of quitting at 3 months. Other independent categorical variables were not predictive of success (Table 1).

Multivariate Predictors of Smoking Cessation at 1 week, 3 months and 6 months

All variables from the univariate analysis were included in this multivariate logistic regression. Variables associated with a successful quit status at 1 week include attending more counselling sessions. At 3 months, success was also predicted by attending more than 1 counselling session (Tables at week 1- and 3-month were not shown). Table 2 concludes that only 2 variables predict sustained cessation at 6 months. Rates of sustained cessation at 6 months were significantly higher among the non-Malays compared with

Table 2. Multivariate Logistic Regression Predicting Sustained Abstinence at 6 Months

Variables	β	SE	Wald x^2	df	Odds Ratio (95% CI)	P value[a]
Number of counselling sessions attended: 2	1.38	0.67	6.97	1	5.00 (1.52 – 16.54)	0.04
Number of counselling sessions attended: 3	2.08	0.71	8.58	1	8.00 (1.99 – 32.16)	<0.01
Number of counselling sessions attended: 4 or more	1.56	0.87	3.17	1	4.75 (0.86 – 26.36)	0.08
Ethnic group	1.84	0.91	4.40	1	6.27 (1.13 – 34.89)	0.04

[a]Adjusted for all the variables in the model

the Malays. Similar to the results at 1 week and 3 months, attending 2 and 3 counselling sessions increased the chance of success.

Discussion

Our aim was to study the cessation rates and predictors of abstinence among a group of university workers attempting to quit with assistance. The 6-month cessation rate of 22% found here was slightly lower than those seen in other workplace cessation programmes at between 20% and 50%[18] and were greater than rates observed in non-workplace programmes, which have generally reported rates of less than 10%.[19] This finding emphasises the advantages of such a workplace programme. Nevertheless, it was shown that the point abstinence rate differs from the sustained abstinence rate, and a lower sustained abstinence rate was noted. The difference observed between point abstinence and sustained abstinence was due to cases of relapse in smokers who failed to maintain quit.

Our findings indicate that clinic session attendance was a strong predictor of successful cessation, as it was noted to be strongly significant at 1 week, 3 months and 6 months. The finding that attending more than one session increased the chance of success was in agreement with one local study conducted in 8 Malaysian government cessation clinics, which found that smokers who attended cessation clinics at least 4 times were more likely to quit.[20] Although the present study included only a minimum of 2 intensive sessions with 1 follow-up session, the intensity of the programme likely added an advantage in producing a similar success rate. Furthermore, another study suggested that the amount of contact time and the number of sessions are not important factors in cessation rates provided that essential effective elements are incorporated to assist and motivate the smokers.[21]

Being of non-Malay descent also predicted a successful quit attempt at the 6 month time point. This outcome, however, must be interpreted with caution, as there were very few non-Malays in the sample. Hence, the result may not be valid, especially when only 3 non-Malay smokers quit at 6 months. During the interviews, non-Malay smokers (who were predominantly Indian) were observed to be more determined in their quit attempt and received greater family support than their Malay counterparts. Lee et al[10] also found a significant difference with regard to ethnicity and smoking cessation among Malaysian smokers. Hence, it would also be of interest to measure and document the cross-cultural aspects (e.g. motivational aspects, traditional methods, cultural perspectives, religious factors) of the cessation attempts among these ethnic groups, as this may provide insight into ways to improve the cessation rates in a multi-ethnic group.

NRT compliance was found to be a significant predictor of success in previous studies.[22] The present study did not find NRT adherence to be an important predictive factor in quitting. A reason for this is that many smokers in this study were not able to comply with NRT as directed due to intolerable side effects. Another factor that was found not to be significant was the environmental influence variable or environmental tobacco smoke (ETS), i.e. exposure to other people smoking. The results indicate that the external environment may play a role in quitting in this study population but was not sufficient to produce a significant outcome, as other factors such as physician support and motivation to quit may dominate.[23] We also suspect that, the impact of imposing the workplace smoke-free policy had reduced ETS and hence assist smokers in maintaining quit status. Evidence from studies with more methodologically robust designs (e.g. randomised controlled trial) is however, required to ascertain this.

Other factors that were found to be positively correlated with successful cessation rates in other studies such as age group,[24] previous quit attempts, education level[25] and marital status[26] were not found to be correlated to a successful attempt in this study. Reasons for this discrepancy could be related to the homogeneity of the sample in this study, as the majority of participants were from lower education levels and socioeconomic statuses. The discrepancy could also be partly related to differences in the culture and ethnicity of the smokers compared with smokers from Western societies, who have different perceptions and norms. Even among smokers with different motivation levels and perception who share similar backgrounds, results may differ.[9,10,27]

There are also several limitations to our present study. Identifying the success rates among workers was not the main purpose of this study and could have been strengthened by the inclusion of additional variables such as types of life stressors, health and psychiatric morbidities. In addition, the sample was predominantly male and Malay. Thus, the results may only be generalised to South East Asian countries. Similarly, the use of this convenience sampling method is subject to bias. The results were therefore limited to smokers who intended to quit, and they may not capture smokers with very poor motivation.

Conclusion

In short, we concluded that in the case of conducting a workplace cessation programme in a smoke-free policy environment, environmental tobacco exposure does not deter a person from achieving long-term abstinence. Nonetheless, individuals who attended more cessation sessions had a higher probability of achieving success with combined medical and behavioural therapy. This result is similar to those in clinic-based smoking cessation. Our

study certainly demonstrates that, conducting a small-scale intra-workplace programme for smokers may give a potentially good outcome on cessation rate and reach individuals with busy working hours. However, this does not necessarily guarantee long-term abstinence. Future research can benefit from a more representative sample which takes into account varying age group, ethnicity and levels of motivation.

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