

ORIGINAL ARTICLE

ONLINE MINDFULNESS THERAPY AS A SMOKING CESSATION AID IN MALAYSIA: A RANDOMIZED CONTROL TRIAL

Hemanath Sinnathamby^{1,2}, Freddie Robinson*¹, Nicholas Pang Tze Ping¹, Lim Eng Kean¹, Ong Shi Joe¹, Alyssa Suraya¹, Joshua Selvaraj¹, Lau Jia Qi¹, Lim Yong Xin¹ and Vanushya Alagasan².

¹Faculty of Medicine and Health Sciences, Universiti Malaysia Sabah.

²Ministry of Health Malaysia.

*Corresponding author: Freddie Robinson

Email: freddie@ums.edu.my

ABSTRACT

Effective smoking cessation programs are crucial in helping smokers to achieve cessation, indirectly reducing smoking-related morbidity and mortality. Several studies have shown promising results using mindfulness therapy and online platforms in smoking cessation. This study assesses the effectiveness of online mindfulness therapy (MT) as an aid in smoking cessation programmes compared with standardized behavioural approaches (SBA). A randomized control trial with a single-blind, two-group design was chosen, with assessment at baseline. Participants were recruited by advertising on social media platforms and accepted according to the eligibility criteria. The participants who fit the eligibility criteria were randomized and divided into two groups. Each group received three sessions of online therapy (MT or SBA) every 2 weeks with one telephone call each week as a reinforcement. Participants filled in questionnaires at baseline and end of the intervention (1st week and 5th week). The data was analyzed using Generalized Estimating Equation (GEE). The number of cigarettes smoked per day post-intervention was significantly lower in the MT group compared with the SBA group ($B: -3.50$, 95% CI -4.62 to -2.39 , p -value: < 0.001). The MT group recorded low Fagerstrom nicotine dependence tests at the end of the study, compared to low to moderate scores in the SBA group ($B: -1.82$, 95% CI -2.31 to -1.33 , p -value: < 0.001). Furthermore, participants in the MT group reduced their urge to smoke more than the SBA group ($B: -2.44$, 95% CI -3.76 to -1.12 , p -value: < 0.001). In conclusion, online MT is more effective in helping smokers in reducing the number of cigarettes smoked per day, nicotine dependence, and urge for smoking compared to SBA. Further follow-up studies using online platforms should be conducted to compare the effectiveness of online MT longitudinally.

Keywords: Smoking cessation; Quit smoking; Mindfulness therapy; Standardized behavioural approaches; Nicotine dependence; Number of cigarettes; Urge for smoking; Addiction

INTRODUCTION

The tobacco epidemic has been estimated to kill more than eight million people yearly, with an estimated 1.2 million deaths each year due to second-hand smokers and 20% of the world population being smokers^{1,2}. The burden in low and middle-income countries is even bigger as it is estimated that over 80% of tobacco users live in these countries³. Moreover, smoking is very hard to quit due to the addictive substance contained, which is complemented by the repetitive behaviour of smoking⁴. Most interventions focus on behavioural treatments that teach individuals strategies to avoid triggers, reduce negative moods, divert attention from cravings, foster positive affective states, reduce stress, develop social support mechanisms or substitute smoking with other activities⁵. Unfortunately, over 70% of smokers want to quit smoking, but fewer than 5% achieve this annually⁶. The limited number of successes may be because smoking triggers are always present, such as positive and negative triggers, which makes avoidance nearly impossible^{7,8}. Furthermore, nicotine addiction itself is one of the reasons a person craves cigarettes and there is strong

evidence that craving is associated with smoking mainly through the psychophysical properties of nicotine⁹.

MT has shown great efficacy in psychological disorders involving pain, anxiety, and depression, and may be an effective behavioural treatment to quit smoking by targeting the above factors, namely addiction and craving, positive and negative triggering factors, and teaching them to take action¹⁰. Its main focus is to control and maintain an individual's immediate experience and maintain a feeling of acceptance of the experience¹¹. Hence, the individual will have the ability to perceive their quality of mental state and recognize these changes in the mind and body rather than feeling the withdrawal symptoms taking over them; this recognition will contribute towards quitting smoking¹²⁻¹⁴.

MT was significantly associated with reduced consumption of substances such as cocaine, alcohol, marijuana, opiates, amphetamines and cigarettes^{13,15}. However, these experimental designs were not randomized and hence did not contribute to highest quality experimental evidence. It has hence been hoped that further

randomized control trials should be conducted to test MT's effectiveness as a smoking cessation aid¹⁶. This is especially true in Malaysia since we lack studies on mindfulness and smoking cessation, as the current practice in Malaysian settings is using standardized behavioural approaches techniques. If good quality studies can be performed in Malaysian populations focusing on the efficacy of mindfulness therapies, this would allow a change in clinical practice in Malaysian settings. Therefore, the objective of this study was to assess the efficacy of MT over SBA through a randomized controlled trial study design.

METHODS

This study was a randomized control trial with a single blind, which was conducted from 2nd July to 3rd September 2022. The study was conducted in Malaysia and was approved by the local research university ethics committee (JKEtika 2/21 - 9) and registered in the Chinese Clinical Trial Registry (ChiCTR) (ID: ChiCTR2200056204). All participants were required to give online informed consent before inclusion in the study.

Sample size estimation was calculated using G-Power software 3.1¹⁷. Given that there has been no study that included MT as a smoking cessation aid in Malaysia, the sample size estimation was taken from available references related to MT in smoking cessation¹⁸⁻²¹. The final pooled effect size of 0.475 was adapted from a previous study done in Hong Kong²². The final calculation tabulated by the G-Power software was 34 participants with a critical F value of 4.15 and a significance level of 0.05. A power of 0.90 was used to calculate the sample size; considering 20% dropout, the final sample size was 44 participants. Participants were recruited through social media platforms and advertisements offering and promoting behavioural treatment for smoking cessation. The inclusion criteria were as follows: adults aged between 18 to 60 years old; smokers who were moderately dependent or highly dependent according to the Fagerstrom test; able to understand Malay and English moderately; had a good internet connection; currently residing in Malaysia. Meanwhile, the exclusion criteria were as follows: underwent/undergoing any other smoking cessation program conducted under a private or government healthcare centre (quit smoking clinics) within the past 3 months; on any kind of nicotine replacement therapy (including e-cigarettes); currently using any kind of psychoactive medications; had a serious or unstable medical/mental condition. Furthermore, to avoid contamination, a few steps were adopted from a study done by Magill et al.²³. Each group received therapy from a separate therapist as one of the steps, which ensured that the therapist did not disclose knowledge about another therapy, and each therapy session was monitored through a recording. The therapist received training in

accordance with which group they were assigned to, either mindfulness or standardized behavioural approaches—but not both. Every participant also received instruction on how to keep what they had learned in therapy sessions to themselves, and those who broke this rule were kicked out of the therapy. The type of intervention being taught to the participants was likewise hidden from them. Finally, participants who agreed to join and fit the eligibility criteria were randomized using computer-generated randomization software into groups A (mindfulness) and B (standardized behavioural approaches).

As explained in the study protocol (Figure 1), before starting the intervention, each participant was required to answer a set of questionnaires to ascertain the baseline values for smoking status, nicotine dependence, and smoking urges. The participant was screened for their eligibility status according to the baseline information. After baseline screening, a total of three sessions of therapy were conducted for both intervention and control groups, with a 2-week gap between each session. Furthermore, during the 2-week gap, the therapists in both groups contacted each participant by phone to reinforce the teaching. All three sessions were conducted completely via the Google Meet online platform, with the MT group receiving three mindfulness therapy sessions, and the SBA group receiving three standardized behavioural approaches therapy sessions. One week after the third session was completed, the participants were again required to answer a set of questionnaires to observe any improvement concerning quitting smoking. This set of questionnaires was repeated after 5 weeks.

The intervention was carried out by licenced clinical psychologists, and the SBA was developed in accordance with the Malaysian Clinical Practice Guidelines for Treatment of Tobacco Use Disorder 2016. Meanwhile, MT was based on Acceptance and Commitment Therapy. With the participants, we practised "being in the present moment" skills as well as breathing and grounding exercises. The need of focusing on the present moment with openness, flexibility, kindness, and acceptance of uncomfortable emotions was emphasised.

The primary outcome was participants' abstinence from tobacco smoking at the end of the research. The abstinence rate was compared between groups using the Chi-Square test. Meanwhile, the secondary outcome was measured by evaluating nicotine dependence (Fagerstrom: Cronbach's alpha 0.67)²³, the urge for smoking (QSU-Brief: Cronbach's alpha: 0.81)²⁴, and the number of cigarettes smoked per day using standardized dual language questionnaires. The tool used to measure nicotine dependence was the Fagerstrom test. For the urge for smoking, the QSU-Brief test was used. The significance level of the differences between both groups was

analyzed by using Generalized Estimating Equation (GEE).

RESULTS

A total of 110 people agreed to join the research but after assessing with the eligibility criteria we had to exclude 61 of them. The 49 participants who fit the eligibility criteria were randomized to the MT group (Group A = 25) and the SBA group (Group B = 24).

Both groups were well matched for sex, age, level of education, chronic illness history, household income, type of cigarettes smoked, pack year, number of cigarettes smoked/day, Fagerstrom score, and QSU-brief score. There were no significant differences between the participants in both groups across all the sociodemographic (sex, education level, chronic medical illness history, household income, type of cigarettes smoked and pack year) variables being tested (refer to Tables 1 & 2). The number of male participants (91.8%) was more than females

(8.2%). Meanwhile, the number of cigarettes smoked per day and total pack year were also almost similar between both groups. We were able to observe that both groups' participants had a moderate degree of nicotine dependence according to their Fagerstrom score. Furthermore, the urge for smoking among the participants in both groups was moderately high at 33 ±9 (MT group) and 34±7 (SBA group).

The abstinence rate at the end of the study for the MT group was 16% (n = 4) and for the SBA group was 8.3% (n = 2); however, the p-value was > 0.05. The number of cigarettes smoked per day was significantly lower in the MT group at the end of the study compared to the SBA group, with a significant p-value of < 0.05. Furthermore, there was a significant difference between the MT and SBA groups in the Fagerstrom nicotine dependence test, with a significant p-value of 0.001. Meanwhile, for the urge for smoking tested using QSU-Brief, there was a considerable amount of reduction seen in the MT group compared with the SBA group with a significance level of < 0.001.

Table 1: Categorical baseline data and cigarette smoking abstinence rate at the end of the study

Variable	Group		n = 49 (%)	Chi ²	p - value
	MT (%)	SBA (%)			
Sex					
Male	24 (53.3)	21 (46.7)	45 (91.8)	-	0.349**
Female	1 (25.0)	3 (75.0)	4 (8.2)	-	
Education level					
Degree and above	9 (47.4)	10 (52.6)	19 (38.8)	0.176	0.916*
Diploma and above	6 (54.5)	5 (45.5)	11 (22.4)		
SPM	10 (52.6)	9 (47.4)	19 (38.8)		
Medical illness					
None	17 (51.5)	16 (48.5)	33 (67.3)	-	1.000**
Chronic illness (1 or more)	8 (50.0)	8 (50.0)	16 (32.7)	-	
Household income					
T20	7 (53.8)	6 (46.2)	13 (26.5)	1.060	0.589*
M40	11 (57.9)	8 (42.1)	19 (38.8)		
B40	7 (41.2)	10 (58.8)	17 (34.7)		
Type of cigarettes					
Filtered	22 (47.8)	24 (52.2)	46 (93.9)	-	0.235**
Non - filtered	3 (12.0)	0	3 (6.1)	-	
Abstinence rate at the end of the study					
Quit smoking	4 (66.7)	2 (33.3)	6 (12.2)	-	0.667**
Still smoking	2 (33.3)	22 (51.2)	43 (87.8)	-	

*Chi-Square test

** Fisher's Exact test

The results from Table 4 (regression analysis) indicate a noteworthy decrease of 3.5 cigarettes per day (95% Wald CI: -4.62, -2.39) in the MT

group in comparison with the SBA group over time, even after accounting for time period and intervention groups. The p-value of < 0.001

further highlights the statistical significance of this finding. Additionally, the analysis also shows a similar effect in terms of the Fagerstrom score and QSU-Brief score, where the MT group demonstrates an average reduction of 1.82 (95% Wald CI of -2.31 to -1.33, p-value < 0.001) and 2.44 (95% Wald CI of -3.76 to -1.12, p-value <

0.001), respectively, compared with the SBA group over time, after adjusting for time period and intervention groups. These findings suggest that the MT intervention may be an effective approach for reducing cigarette consumption and nicotine dependence in individuals.

Table 2: Numerical baseline data result analyzed using Mann - Whitney U Test

Variable	MT (Mean Rank)	SBA (Mean Rank)	MT (Sum Rank)	SBA (Sum Rank)	Mann-Whitney U	p-value
Age	23.92	26.12	598.0	627.0	273.0	0.588
No. cigarette	25.94	24.02	648.5	576.5	276.5	0.629
Fagerstrom	27.82	22.06	695.5	529.5	229.5	0.143
QUS - Brief	24.64	25.38	616.0	609.0	291.0	0.857
Pack Year	23.76	26.29	594.0	631.0	269.0	0.535

Table 3: Association of MT and SBA groups between all variables over time analyzed using GEE Test

Variable	Time	Mean		df	Wald Chi ²	p-value
		MT (SD)	SBA (SD)			
No. cigarettes smoked	Baseline	16.52 (4.16)	16.04 (4.32)	1	37.78	< 0.001
	1 st reading	11.72 (3.57)	14.00 (5.23)			
	2 nd reading	6.64 (4.46)	13.17 (6.41)			
Fagerstrom	Baseline	6.12 (1.27)	5.63 (1.37)	1	53.75	< 0.001
	1 st reading	4.48 (1.85)	5.17 (1.70)			
	2 nd reading	1.48 (1.61)	4.63 (2.26)			
QSU- Brief	Baseline	33.28 (8.65)	34.13 (7.49)	1	13.12	< 0.001
	1 st reading	30.64 (7.40)	33.92 (7.70)			
	2 nd reading	27.32 (7.52)	33.04 (7.97)			

Table 4: Awareness about breast self-examination and mammogram among females in Selangor

Variable (reference = MT)	β	95% Wald Confidence Interval		p-value
		Lower	Upper	
No. cigarettes smoked	-3.50	-4.62	-2.39	< 0.001
Fagerstrom	-1.82	-2.31	-1.33	< 0.001
QSU- Brief	-2.44	-3.76	-1.12	< 0.001

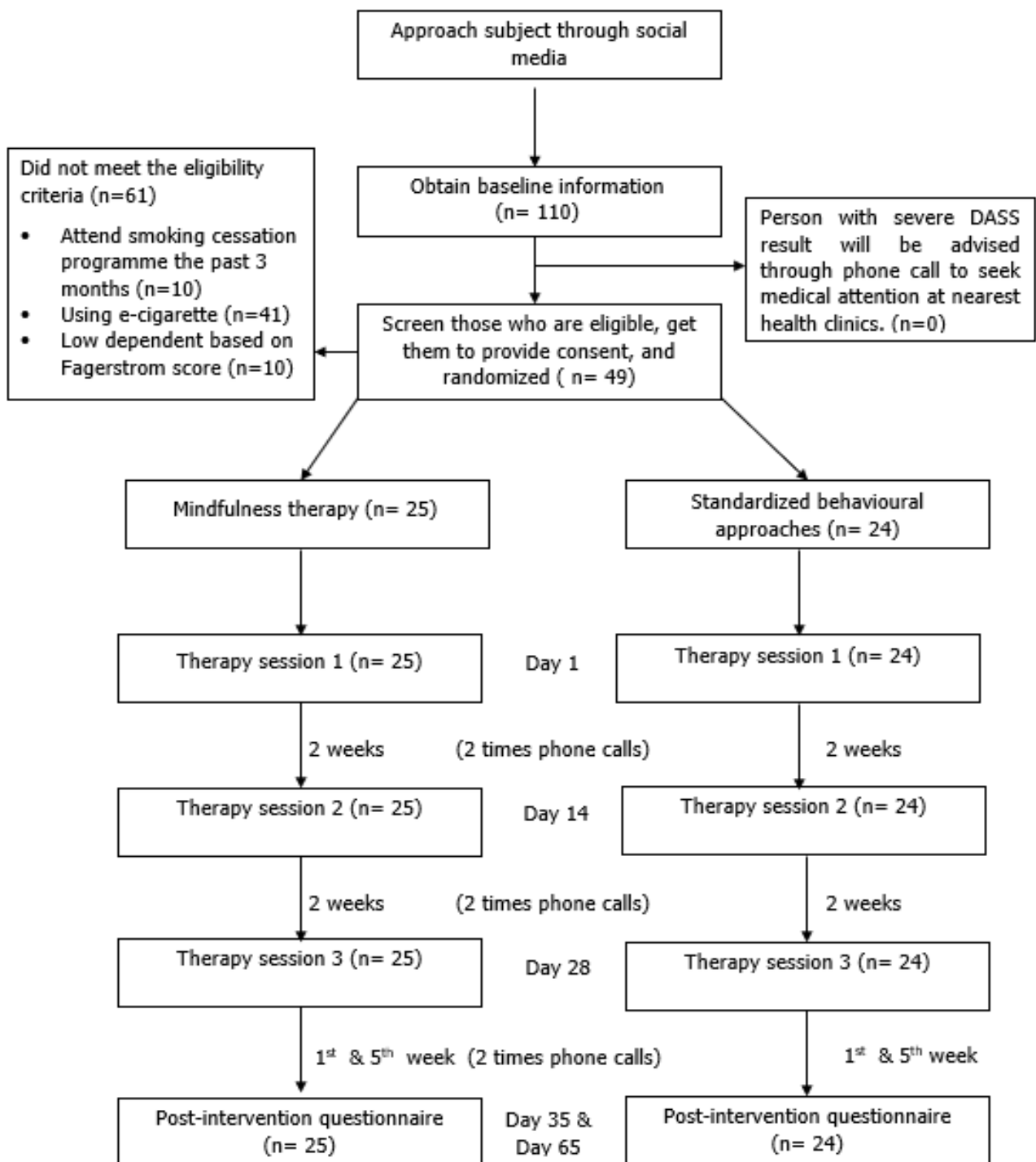


Figure 1: Study protocol

DISCUSSION

MT is a systematic programme which involves training individual attention and self-control with an attitude of acceptance and openness to external and internal experiences^{25,26}. Given that the core clinical symptoms of any kind of addiction revolve around intoxication, bingeing, craving, and withdrawal, MT may be helpful as a coping mechanism, whereby it creates awareness of intoxication, and control of bingeing, withdrawal and craving, which together works as a supporting pillar against negative emotion and stress reactivity²⁶.

This clinical trial is the first in Malaysia to test online MT to help with smoking cessation. In clinical practice, current smoking cessation programmes may have psychologists using MT; however, this is the first time outcomes in a clinical trial have been examined. Though the difference between the MT group and the SBA group for abstinence rates was statistically insignificant, MT still demonstrated numerically superior abstinence outcomes. There was a significant reduction in the number of cigarettes smoked daily which is an important stepping stone in the journey of quitting smoking; the evidence suggests that people with lower numbers of daily cigarettes smoked have a greater likelihood of achieving smoking cessation^{27,28}. Furthermore, reducing the number of cigarettes smoked per day also has strong associations with reducing mortality rates, lung cancer, and respiratory diseases²⁸.

The major obstacle in any smoking cessation journey is addiction, operationalised in this study as nicotine dependence. In this study, we were able to prove there was a significant reduction in nicotine dependence in the MT group from moderate dependence to low dependence. Fagerstrom scores are a useful predictor of smoking cessation²⁹, and quitting intention is more significantly associated with quitting behaviour for the low nicotine dependence group compared to other groups according to a previous study, suggesting that participants in MT have a higher likelihood of achieving smoking cessation than the SBA group³⁰.

The majority of smokers who achieve cessation relapse due to craving and the urge to smoke^{31,32} and craving is also a significant factor that can lead to relapse during attempts to quit smoking and is associated with some degree of resisting the urge to smoke cigarettes³³. Furthermore, resisting something will always create a certain degree of urge and craving³⁴. In our study, we discovered that the MT group significantly reduced their QSU-Brief score—which measures the intensity of the urge to smoke—compared to the SBA group. Although the decrease in the QSU-Brief score in the group receiving MT was not great, it is compatible with the guiding principles

of mindfulness-based interventions, that do not force their subjects to fight the impulse to smoke. Instead, they aim to enhance self-regulation ability by teaching participants to use mindfulness techniques to respond flexibly to the urge to smoke, without resorting to cigarettes.

Quitting smoking is more of a dynamic process of reduction, abstinence, and relapse rather than a one-way path of smoking cessation³⁵. Thus, treatments should accommodate the need and the shifts in the dynamic process of smoking cessation. Furthermore, this is the reason that even though we were unable to achieve a significant result in smoking abstinence, MT is still superior compared to SBA in terms of aiding smokers in the journey of cessation because it helps in reducing the number of cigarettes smoked per day, nicotine dependence and urge for smoking which is beneficial in the long run of smoking cessation.

Overall, an online smoking cessation programme is a feasible and effective approach, as both groups show a promising reduction in the number of cigarettes smoked per day and nicotine reduction. Likewise, other studies have also proved that online-based smoking cessation interventions are effective in helping smokers to quit smoking^{36,37}. One of the reasons for this success is that the intervention sessions break the burden of the clinical visit³⁷ which is a major barrier for smokers seeking help. Furthermore, smokers are also to negate the feeling of being stigmatized and fear of failure in online smoking cessation programmes because they are not physically present. Feeling stigmatized causes failures in smoking cessation and results in dropouts from the programme³⁸.

Limitation

The study is questionnaire-based, so it depends on the honesty of the respondents answering the question, thus information bias might be present, especially in self-declaring smoking abstinence. Hence, in future studies, we can include potentially one visit to the nearest quit-smoking clinic every month to get carbon monoxide (CO) levels checked as proof of abstinence. CO analyzer can also play a role as a motivational tool in the smoking cessation programme³⁹. Furthermore, given resource constraints, we were only able to focus on cigarette smokers and had to reject 41 e-cigarette users. Therefore, in any future study, we should include e-cigarette users as well given the current generation of smokers is leaning toward e-cigarettes more than conventional tobacco cigarettes. Time also was a limitation in our study because we were unable to conduct a long-duration study. In the future, a longer follow-up could be conducted to get a better picture of smoking cessation behaviour among smokers.

CONCLUSION

Online MT is more effective in helping smokers reach cessation compared to the current SBA method which is being used widely in all smoking cessation clinics in Malaysia. Despite not achieving significant results for the smoking abstinence rate, we were able to prove the efficacy of online MT over SBA in three major aspects: reducing number of cigarettes smoked per day, reducing nicotine dependence levels, and reducing urge for smoking. Furthermore, online therapy platforms show significant benefits and are feasible as both groups had a noticeable reduction in the number of cigarettes smoked per day and overall nicotine dependence. Finally, further follow-ups and more studies using online platforms should be conducted to compare the effectiveness of larger-scale and longer-term mindfulness therapies.

List of acronyms

- i. MT - Mindfulness therapy
- ii. SBA - Standardized behavioural approaches
- iii. CO - Carbon monoxide
- iv. GEE - Generalized Estimating Equation

Ethics approval and consent to participate

Ethics approval was obtained from Universiti Malaysia Sabah Ethical Board (Code: JKEtika 2/21 - 9) and registered in the Chinese Clinical Trial Registry (ChiCTR) (ID: ChiCTR2200056204).

Human and animal rights

The procedures of this study complied fully with the provisions of the Helsinki Declaration regarding research with human participants. All participants provided informed consent electronically before enrolment.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

1. John Elflein. Topic: Smoking. Statista. 2020. Retrived from: <https://www.statista.com/topics/1600/smoking> (assessed on 25 Nov 2020)
2. Ritchie H, Roser M. Smoking. Our World in Data [Internet]. 2013; Retrived from: <https://ourworldindata.org/smoking> (assessed on 25 Nov 2020)
3. WHO. Tobacco [Internet]. 2020. Retrived from: <https://www.who.int/news-room/fact-sheets/detail/tobacco> (assessed on 13 Apr 2021)
4. Roh S. Scientific Evidence for the addictiveness of tobacco and smoking cessation in tobacco litigation. *J Prev Med Public Health*. 2018 Jan;51(1):1-5.
5. Garrison KA, Pal P, Rojiani R, Dallery J, O'Malley SS, Brewer JA. A randomized controlled trial of smartphone-based mindfulness training for smoking cessation: a study protocol. *BMC Psychiatry*. 2015 Apr 14;15(1):83.
6. FDA C for T. Quitting Smoking: Closer with every attempt. FDA. 2020; Retrived from: <https://www.fda.gov/tobacco-products/health-information/quitting-smoking-closer-every-attempt> (assessed on 25 Nov 2020)
7. Bevins RA, Palmatier MI. Extending the role of associative learning processes in nicotine addiction. *Behav Cogn Neurosci Rev*. 2004 Sep;3(3):143-58.
8. Buczkowski K, Dachtera-Fraćkiewicz M, Luszkiwicz D, Klucz K, Sawicka-Powierza J, Marcinowicz L. Reasons for and scenarios associated with failure to cease smoking: Results from a qualitative study among polish smokers who had unsuccessfully attempted to quit. *Patient Prefer Adherence*. 2021 Sep 16;15:2071-84.
9. Fernandes TM de P, Almeida NL de, Santos NA dos. Effects of smoking and smoking abstinence on spatial vision in chronic heavy smokers. *Sci Rep*. 2017. Retrived from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5431787/> (assessed on 15 Dec 2020)
10. Brewer JA, Sinha R, Chen JA, Michalsen RN, Babuscio TA, Nich C, et al. Mindfulness training and stress reactivity in substance abuse: results from a randomized, controlled stage I pilot study. *Subst Abus*. 2009 Dec;30(4):306-17.
11. Bishop SR, Lau M, Shapiro S, Carlson L, Anderson ND, Carmody J, et al. Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*. 2004;11(3):230-41.
12. Brewer JA, Bowen S, Smith JT, Marlatt GA, Potenza MN. Mindfulness-based treatments for co-occurring depression and substance use disorders: What can we learn from the brain? *Addiction*. 2010 Oct;105(10):1698-706.

13. Chan EY. Mindfulness and smoking frequency: An investigation with Australian students. *Addictive Behaviors Reports*. 2021 Jun 1;13:100342.
14. Teasdale JD, Moore RG, Hayhurst H, Pope M, Williams S, Segal ZV. Metacognitive awareness and prevention of relapse in depression: empirical evidence. *J Consult Clin Psychol*. 2002 Apr;70(2):275-87.
15. Chiesa A, Serretti A. Are mindfulness-based interventions effective for substance use disorders? A systematic review of the evidence. *Subst Use Misuse*. 2014 Apr;49(5):492-512.
16. Jackson S, Brown J, Norris E, Livingstone-Banks J, Hayes E, Lindson N. Mindfulness for smoking cessation. *Cochrane Database Syst Rev*. 2022 Apr 14;2022(4):CD013696.
17. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*. 2009 Nov 1;41(4):1149-60.
18. Bricker J, Wyszynski C, Comstock B, Heffner JL. Pilot randomized controlled trial of web-based acceptance and commitment therapy for smoking cessation. *Nicotine Tob Res*. 2013 Oct;15(10):1756-64.
19. Gifford EV, Kohlenberg BS, Hayes SC, Antonuccio DO, Piasecki MM, Rasmussen-Hall ML, et al. Acceptance-based treatment for smoking cessation. *Behavior Therapy*. 2004;35(4):689-705.
20. Gifford EV, Kohlenberg BS, Hayes SC, Pierson HM, Piasecki MP, Antonuccio DO, et al. Does acceptance and relationship focused behavior therapy contribute to bupropion outcomes? A randomized controlled trial of functional analytic psychotherapy and acceptance and commitment therapy for smoking cessation. *Behav Ther*. 2011 Dec;42(4):700-15.
21. Hernández-López M, Luciano MC, Bricker JB, Roales-Nieto JG, Montesinos F. Acceptance and commitment therapy for smoking cessation: a preliminary study of its effectiveness in comparison with cognitive behavioral therapy. *Psychol Addict Behav*. 2009 Dec;23(4):723-30.
22. Mak YW, Loke AY. The acceptance and commitment therapy for smoking cessation in the primary health care setting: a study protocol. *BMC Public Health*. 2015 Feb 7;15(1):105.
23. Yee HA A, Cg N, Ar R. Validation of the Malay version of fagerstrom test for nicotine dependence (FTND-M) among a group of male Staffs in a University Hospital. *Malaysian Journal of Psychiatry*. 2011 Jun;20(1):30.
24. Blebil AQ, Sulaiman SAS, Hassali MA, Dujaili JA, Zin AM. The Malay version of the brief questionnaire on smoking urge: Translation and psychometric properties of the questionnaire. *Journal of Epidemiology and Global Health*. 2015 Mar 1;5(1):15-22.
25. Hölzel BK, Lazar SW, Gard T, Schuman-Olivier Z, Vago DR, Ott U. How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspect Psychol Sci*. 2011 Nov;6(6):537-59.
26. Tang YY, Yang L, Leve LD, Harold GT. Improving executive function and its neurobiological mechanisms through a mindfulness-based intervention: Advances within the field of developmental neuroscience. *Child Dev Perspect*. 2012 Dec;6(4):361-6.
27. Begh R, Lindson-Hawley N, Aveyard P. Does reduced smoking if you can't stop make any difference? *BMC Med*. 2015 Oct 12;13:257.
28. Inoue-Choi M, Hartge P, Park Y, Abnet CC, Freedman ND. Association between reductions of number of cigarettes smoked per day and mortality among older adults in the United States. *American Journal of Epidemiology*. 2019 Feb 1;188(2):363-71.
29. Ikonomidis I, Thymis J, Kourea K, Kostelli G, Neocleous A, Katogiannis K, et al. Fagerstrom score predicts smoking status six months after hospitalization for acute myocardial infarction: a prospective study. *Hellenic Journal of Cardiology*. 2022 Sep 1;67:28-35.
30. 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.
31. Rodríguez-Cano R, López-Durán A, Martínez-Vispo C, Becoña E. Causes of smoking relapse in the 12 months after smoking cessation treatment: Affective and cigarette dependence-related factors. *Addictive Behaviors*. 2021 Aug 1;119:106903.
32. van Zundert R, Ferguson S, Shiffman S, Engels R. Dynamic effects of craving and negative affect on adolescent smoking relapse. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association*. 2011 Sep 26;31:226-34.

33. Tang YY, Tang R, Posner MI. Brief meditation training induces smoking reduction. *Proc Natl Acad Sci U S A*. 2013 Aug 20;110(34):13971-5.
34. Hartwell KJ, Johnson KA, Li X, Myrick H, LeMatty T, George MS, et al. Neural correlates of craving and resisting craving for tobacco in nicotine dependent smokers. *Addict Biol*. 2011 Oct;16(4):654-66.
35. Peters EN, Hughes JR. The day-to-day process of stopping or reducing smoking: A prospective study of self-changers. *Nicotine Tob Res*. 2009 Sep;11(9):1083-92.
36. Kant R, Yadav P, Bairwa M. Effectiveness of the internet-based versus Face-to-Face Interaction on Reduction of tobacco use among adults: A meta-analysis. *Cureus*. 2021;13(11):e19380.
37. Kato A, Tanigawa T, Satake K, Nomura A. Efficacy of the asure smoking cessation program: Retrospective study. *JMIR Mhealth Uhealth*. 2020 May 14;8(5):e17270.
38. Lozano P, Thrasher JF, Forthofer M, Hardin J, Shigematsu LMR, Arillo Santillán E, et al. Smoking-related stigma: A public health tool or a damaging force? *Nicotine Tob Res*. 2018 Jul 25;22(1):96-103.
39. Vasthare. Carbon monoxide breath analyzers and its role in tobacco cessation: A narrative review of literature. 2018. Retrived from: <https://www.jioh.org/article.asp?issn=0976-7428;year=2018;volume=10;issue=2;spage=71;epage=76;aulast=Vasthare> (assessed on 26 Jan 2023)