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RESEARCH PAPER

Assessing motivational interviewing via co-active life coaching on selected smoking cessation outcomes

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Abstract

The objective of this study was to assess the impact of Motivational Interviewing (MI)-via-Co-Active Life Coaching (CALC) on: smoking behaviours, personal competency as well as changes in perceptions of identity, smoking, quitting and the intervention itself among young adults (aged 19–25 years) in Canada. A mixed methods intent-to-treat approach was taken; the impact of 8–10 MI-via-CALC sessions on smoking behaviour and personal competency of 40 young adult smokers was examined through both questionnaires and individual interviews over 1 year. The immediate-intervention group received MI-via-CALC starting right after enrolment, whereas the waitlist-intervention group was placed on a waitlist for 3 months and then received the intervention. The immediate-intervention group decreased significantly from baseline to post-intervention in smoking behaviours, including the number of cigarettes smoked per day and cigarette dependency; and increased significantly in personal competency, including self-esteem and self-efficacy compared with the waitlist-intervention group. Moreover, 27.5% of participants after receiving the intervention were smoke-free at 12-month post-intervention follow-up. Additionally, qualitative themes pertaining to perceptions of identity, smoking, quitting and the intervention and their changes over time were described and were consistent with quantitative findings. Together, the high cessation rate for the entire study as well as the significant decreases in smoking behaviours and increases in personal competency of the intervention group compared with the waitlist group underscore the impact on behaviour change. MI-via-CALC offers a theoretically grounded, practical and efficacious cessation strategy for young adult smokers.

Keywords

Cessation, co-active life coaching, motivational interviewing, smoking, young adults

History

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Introduction

Smoking is a leading cause of preventable death in the world, and in 2008, there were ~4.9 million smokers in Canada (Canadian Tobacco Use Monitoring Survey (CTUMS), 2008). Of particular concern, is the recent rise of smoking initiation rates among adolescents which had reached a plateau in the 1970s and remained stable through the 1980s (Falomir & Invernizzi, 1999; Lynch & Bonnie, 1994). The most effective and cost-efficient way smokers can improve their health is through cessation (Edwards, 2004). Specifically, the age at which smokers quit is directly proportional to the number of years added to their life, and quitting smoking by age 30 years results in an average potential life gain of 10 years (Doll, Peto, Boreham, & Sutherland, 2004; Taylor, Hasselblad, Henley, Thun, & Sloan, 2002). The adverse health risks attributed to smoking are well documented, widely accepted and cost Canadians an estimated 17 billion dollars annually in both direct and indirect expenditures (Public Health Agency of Canada, 2009). Among the numerous health risks associated with smoking, the most deleterious is mortality, with tobacco accounting for 18% of North American deaths annually (Doll et al., 2004). Consequently, the economic and human losses as well as potential years and quality of life gained that are associated with smoking and cessation, respectively, position tobacco research as a societal necessity.

As many as 69% of smokers want to quit and in 2010, 52% attempted cessation (Centers for Disease Control and Prevention, 2011). To that end, numerous smoking cessation programmes and medications have been devised and introduced to help smokers reach cessation goals, each with varying degrees of success (Samet, 1990). Among adult smokers wanting to quit, most struggle to do so using available interventions, evident by the limited cessation success (Centers for Disease Control and Prevention, 2011; Simon, 2011). Consequently, smokers' desires and struggles to quit point to the need for both empirical assessments of current cessation strategies to inform best practices, and innovative approaches to increase success. Underscoring the

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need for effective cessation strategies, the World Health Organization's Framework Convention for Tobacco Control – an initiative attempting to avert 1 billion tobacco-related deaths in 171 countries during the twenty-first century, created a mandate to identify evidence to guide actions (Lavack & Clark, 2007).

One cessation approach showing evidence-based promise is Motivational Interviewing (MI; Miller & Rollnick, 2012). In a meta-analysis by Lai, Cahill, Qin and Tang (2010), the authors found 14 MI interventions, compared with either advice or usual care, resulted in significant, albeit modest, increases in cessation (RR = 1.27). Moreover, when a physician or counsellor delivered MI there was either an increase or maintenance in cessation success (RR = 3.49 and 1.27, respectively). However, there was insufficient data to determine if multiple sessions were more effective than a single session. The main concerns highlighted by this meta-analysis, and since corroborated by additional research, were treatment fidelity, consistency of MI delivery, lack of training description and ambiguity in content of MI sessions (Hettema & Hendricks, 2010; Lai et al., 2010; Mesters, 2009). In the most recent 2013 edition of ''Motivational Interviewing, Helping People Change'', additional sections on specific skills to be used within MI conversations are included (Miller & Rollnick, 2013). Although they caution against using a standardized approach in the delivery of MI, Miller and Rollnick also acknowledge that evidence of its utility varies widely. The authors underscore that ''[t]here is no minimum or sufficient 'dose' of training to guarantee competence in MI'' (Miller & Rollnick, 2013, p. 384) and that ''[f]idelity of delivery is an important consideration in understanding outcomes of MI...'' (Miller & Rollnick, 2013, p. 385) Although MI is intended to be utilized in the manner best fitting the provider – recipient pairing, this individualized approach can make it difficult to assess from a research perspective, where the aim is to be as clear as possible about what the intervention entails.

To help address the above concerns, a recent innovative smoking cessation pilot study assessed the efficacy of delivering MI via the model and techniques of Co-Active Life Coaching (CALC; Mantler, Irwin, & Morrow, 2010). Previously, Newnham-Kanas, Morrow and Irwin (2010, p. 42) assessed the relationship between MI and CALC and concluded that ''[I]n response to previous criticism about the difficulty in applying MI principles..., the application-based tools offered within the Co-Active model... may be used to put MI tenets into practice''. CALC is a theoretically grounded, application-based and tool-oriented model requiring thorough and professional training to obtain certification (Newnham-Kanas et al., 2010). For a full review of the theoretical underpinnings of this MI-via-CALC approach, ones that were evaluated and consequently underscored previously, please refer to the works by Irwin and Morrow (2005) and Pearson (2011). In a 2010 study of nine smokers aged 19–29 years, 22% quit and remained smoke-free at 6-month follow-up when MI-via-CALC was implemented for an average of nine sessions over a 3-month period (Mantler et al., 2010). Moreover, participants demonstrated, both quantitatively and qualitatively, increases in personal competencies (i.e. self-esteem and self-efficacy), shifts in identity related to smoking cessation, and an overwhelmingly positive experience of the intervention (Mantler et al., 2010). The cessation rate for the study was comparatively higher than other MI interventions, which reported cessation rates ranging from 5% to 18% (Soria, Legido, Escolano, Yeste, & Montoya, 2006; Wakefield, Olver, Whitford, & Rosenfeld, 2004). The pairing of MI with CALC addressed two implementation weaknesses of MI highlighted in previous studies, namely, the lack of application-based training and consistent implementation (Hettema & Hendricks, 2010; Mesters, 2009). Although not a perfect proxy for a thorough MI intervention fidelity assessment, the CALC model seems to help address the aforementioned weaknesses because there is a minimum and consistent standard required to obtain certification. Specifically, CALC certification requires an extensive training program (five, 3-d training courses, totalling over 100 h, followed by an extensive 25-week certification program accompanied by a written and practical examination) all of which helps to ensure the acquisition of concrete skills facilitating the consistent implementation of principles (Kimsey-House, Kimsey-House, Sandahl, & Withworth, 2011; Whitworth, Kimsey-House, & Sandahl, 1998; Whitworth, Kimsey-House, Kimsey-House, & Sandahl, 2007). However, the limitations of this pilot study were the lack of formal MI fidelity assessment, the obvious lack of statistical power due to limited sample size ($n = 9$) and no true control group for comparison. Those limitations aside, the promising findings noted above, pointed to the need for further study that seeks to overcome the limitations of the pilot study and attempts to replicate findings on a larger scale. This study helps to determine the extent to which the MI-via-CALC approach can assist smokers in quitting on a longer term basis (i.e. with a follow-up for 1 year). Thus, findings from this study make an important contribution, in terms of delineating and documenting the impact of MI-via-CALC on cessation as well as key psychosocial constructs such as the enhancement of smokers' confidence and belief in themselves, self-esteem and self-efficacy towards achieving their cessation goals.

Methods

Objective

The objective of this study was to assess the impact of MI-via-CALC on: smoking behaviours, personal competency and perceptions of identity, smoking, quitting and the intervention itself among young adults in Canada. Smoking behaviours were assessed in terms of number of cigarettes smoked per day, cigarette dependency and biochemically verified cessation (cotinine saliva test). Personal competency was assessed via self-esteem and self-efficacy measures/scales related to avoiding the temptation to smoke; these measures and their associated constructs have been found to be important predictors of attempting/sustaining cessation attempts (Cohen et al., 1989; Kowalski, 1997; Matheny & Weatherman, 1998; Mothersill, McDowell, & Rosser, 1988; Ockene, Benfari, Nuttall, Hurwitz, & Ockene, 1982). As underscored by Teddlie and Tashakkori (2009), the inclusion of a qualitative research component is especially useful in behavioural research to gain a fuller understanding of the

participants' experiences as they engage with the intervention under investigation. Consequently, a mixed-methods approach was utilized for this study and as such, perceptions of identity, smoking, quitting and the intervention were also explored qualitatively through one-on-one semi-structured interviews.

Participants

Forty smokers, aged 19–29 years were recruited in Ontario from September 2010 to January 2011 via mass email and posters at an academic institution in South-Western Ontario. Media recruitment was also employed, consisting of radio and newspaper advertisements. Over 300 individuals expressed an interest to participate within 5 d of recruitment and the first 40 eligible participants (of 55 screened) were invited to participate (i.e. English speaking, aged 19–29 years and willing to set a quit date within the next 4 weeks). Thirty-five participants completed the entire intervention protocol (i.e. all the intervention sessions). Five participants dropped out prior to completing three sessions with their coach; two participants (one from each group) dropped out prior to engaging in any of the intervention sessions due to family or personal emergencies unrelated to the study; two participants dropped out prior to the second and third intervention sessions with the coach (both were from the immediate-intervention group) and could not be contacted by the researcher or coach; and one participant together with his/her coach decided during the third session that counselling was a more appropriate intervention (from the waitlist-intervention group). Therefore, an intent-to-treat analysis was used.

Study procedure

Participants were randomly assigned to either an immediate-intervention group 1 ($n = 20$); or waitlist-intervention for 3 months followed by an assessment and subsequently the intervention, group 2 ($n = 20$). Data were collected in five distinct phases (baseline, immediate post-intervention, 3-, 6- and 12-month post-intervention) with both (1) structured questionnaires aimed at gathering data pertaining to smoking behaviour, cigarette dependency, self-esteem and self-efficacy and (2) a one-on-one semi-structured interview which probed perceptions of identity, smoking, quitting and the intervention. Standardized self-report measures and survey questions measuring variables of interest were collected either over the telephone or in-person via assessments (both questionnaire and interview) lasting a total of 35–60 min. An intent-to-treat analysis was utilized for the 40 participants enrolled in this study. Prior to completing both the questionnaires and engaging in the in-depth semi-structured interviews, which lasted 30 to 45 min, honesty demands were utilized to reduce demand characteristics (i.e. participants were told there were no right or wrong answers and asked to respond as honestly as possible to all questions; Bates, 1992). Furthermore, to promote participant trust via confidentiality assurance, participants were informed that the team members were not privy to the content of MI-via-CALC sessions between each participant–coach pairing. Ethical approval was obtained through Western University's Office of Research Ethics prior to recruitment and written consent was obtained from each participant prior to beginning the study. Participants were provided with telephone calling cards to cover costs of both the telephone-based coaching sessions and research follow-up assessments.

Intervention

The intervention consisted of between 8 and 10, 30-min sessions with a Certified Professional Co-Active Coach (CPCC) over the telephone or by Skype over 3 months. This intervention length and duration was modelled after the findings of the pilot study, which indicated that participants felt 8–10 sessions to be the number needed for meaningful behaviour change (Mantler et al., 2010). Furthermore, as was also done in the pilot study, we utilized the participants' academic terms as the natural starting and ending periods. Coaches had no affiliation with the study or research team and were recruited via an electronic post on the Co-Active Coaches Network, which sought coaches interested in donating time for a smoking cessation research study. Thirteen coaches from all over North America were interested and responded to the post and participated by coaching between one and four participant(s) for the duration of the intervention (8–10 sessions), and three coaches enrolled for both groups 1 and 2. Coaches ranged in experience from <1 year post-certification to >10 years; however, all coaches were certified CALC coaches and agreed to utilize only CALC tools during the sessions (in case they had additional, unrelated training). For each session participants were asked to initiate both contact with the coach at a pre-arranged time and have a specific focus for the session although the focus did not have to be smoking or cessation related. The CALC model uses mainly open-ended questions to promote insight and help the participant access his/her own answers. Although specific content of the sessions remained confidential between the coach and participant pairs, typical CALC techniques include: designing an alliance (i.e. how the coach/participant relationship would work); asking thought provoking, open-ended questions; being genuinely curious about the participant; championing and acknowledging the participant's actions; challenging and holding the participant accountable to set, work towards and attain goals; and holding the participant's agenda (for a complete description of the CALC model, refer to Kimsey-House and collegues, 2011). Finally, MI-via-CALC is foundationally about supporting and encouraging autonomy. This premise resulted in several participants deciding, during their MI sessions, to incorporate additional supports as part of their cessation strategy, specifically, the use of nicotine replacement therapy (NRT; Table 1). Where the use of additional supports might be considered a concern in terms of confounding the intervention, it is considered a success in this study, given the MI-via-CALC approach is about supporting clients in making decisions/or taking actions in service of their goals [and the participants' choice, un-prompted by the coach(es), to adopt NRT fits this approach].

Measures

Given the theoretical complexity of the variables under investigation, multiple indicators were utilized to encapsulate the dimensions of each construct. Scores were computed

Table 1. Characteristics of study population at baseline and quit status over follow-up periods ($N = 40$).

Population characteristics	*N* (%)	
Gender		
Male	26 (65.0)	
Female	14 (350.)	
Age (years)		
<20	3 (7.5)	
21–25	32 (80.0)	
>26	5 (12.5)	
Highest education level achieved		
High school	2 (5.0)	
Some university	22 (55.0)	
University	9 (22.5)	
Some graduate school	3 (7.5)	
Graduate school	4 (10.0)	
Smoke-free at assessment[b,c,d]		
T1 (baseline 2)	0 (0.0)	
T2 (post-intervention)	19 (47.5)	
T3 (3 months post-intervention)	10 (25.0)	
T4 (6 months post-intervention)	12 (30.0)	
T5 (12 months post-intervention)	11 (27.5)	
	Quit	Smoking
Quit aid usage[a]		
None	6 (15.0)	21 (52.5)
Patch	4 (10.0%)	4 (10.0)
Gum	1 (2.5)	3 (7.5)
Electronic cigarette	0 (0.0)	1 (2.5)
Number of MI-via-CALC sessions[a]		
0	0	5 (12.5)
7	2 (5.0)	2 (5.0)
8	1 (2.5)	0 (0.0)
9	7 (17.5)	22 (55.0)
10	1 (2.5)	1 (2.5)
	Mean (SD)	Range
Average number of cigarettes per day	11.51 (6.78)	2–25
Age started smoking (years)	15.57 (3.28)	12–21
Longest previous cessation (days)	141.26 (254.90)	1–1460

An intent-to-treat analysis was utilized.

[a]Results at 12-month follow-up assessment is presented with six participants utilizing NRT from the immediate-intervention group and seven utilizing NRT from the waitlist-intervention group.

[b]Results are presented based on merged groups (immediate and waitlist intervention) at the same time points.

[c]There was no differences in the proportion of smoke-free participants between the two treatment groups, once treatment had been received at post-, 3-, 6- and 12-month follow-up.

[d]When participants were lost to follow-up they were assumed to be smoking.

based on previously validated scales and main outcome variables included: smoking behaviour and personal competency.

Smoking behaviour

Smoking behaviour was measured by three conventional indicators: number of cigarettes smoked per day, cigarette dependency and cessation. First, a single-item question asked participants to report an average number of cigarettes smoked per day over the last 7 d. Patrick et al. (1994) confirmed that self-report cessation is a reasonably valid approach to ascertain this information. Additionally, the Cigarette Dependency Scale (CDS), a uni-dimensional, continuous measure that reflects DSM-IV criteria for dependency and is considered both valid and reliable (Cronbach's $\alpha > 0.84$; Etter, 2008), was utilized to assess addiction. Cigarette dependency was measured by summing scores; higher scores denoted increased addiction. Finally, cessation was based on both a self-report to a yes/no question (i.e. Are you currently smoking?) at all assessment points and via a cotinine saliva test at 12-month follow-up (to verify cessation claims biochemically). Cotinine is a major metabolite of nicotine and is used as cessation verification instead of nicotine due to its greater stability and longer biological half-life (Zevin, Jacob, & Benowitz, 1997). The saliva test protocol consisted of a swab being placed under the participant's tongue for $\sim$2 min; subsequently, the swab was placed in a sealed tube for analysis and given a unique identification number (as advised by Salimetrics). Samples were packaged in dry ice and shipped to Salimetrics, an independent laboratory specializing in analysis of biological samples. Salimetrics assessed cessation via a duplicate analysis of a single sample using gas-liquid chromatography with scores <15 ng/ml denoting cessation.

Personal competency

Personal competency was measured using two measures of self-esteem and self-efficacy. The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1989), a previously validated 10-item tool that assesses global self-esteem using a 4-point Likert scale was utilized (Cronbach's $\alpha > 0.77$ and convergent validity of 0.83). Self-efficacy was measured via the 12-item Smoking Self-Efficacy Questionnaire (SEQ) which comprises two sub-scales (internal and external stimuli with Cronbach's α of 0.95 and 0.94, respectively). Internal self-efficacy refers to the temptation to smoke based on emotional states (e.g. feeling stressed or anxious), whereas external self-efficacy considers the temptation to smoke based on environmental situations (e.g. smoking with friends or when drinking alcohol). SEQ is scored on a 5-point Likert scale, with lower scores (or decreases in scores over time) representing less temptation to smoke and therefore higher self-efficacy (Etter, Bergman, Humair, & Perneger, 2000).

Interviews

The baseline and 12-month follow-up one-on-one individual interviews were conducted in person, at a mutually convenient location for the lead researcher (T.M.) and each participant and the remainder of follow-ups (post-intervention, 3-months post-waitlist, 3- and 6-month post-intervention follow-ups) were completed over the telephone with either the lead researcher or trained research assistant (T.M./R.F.). The interviews consisted of 8–10 questions and focused on ascertaining an understanding of participants' perceptions of identity, smoking, quitting and the intervention (e.g. What is it like being you now compared to the start of the intervention? What is a barrier to quitting? What is a facilitator to quitting? What is important to you about quitting/smoking? What was your experience of being in the study? etc.) at each time point. Interviews were audio-recorded, transcribed verbatim and a number of data trustworthiness steps suggested by Guba and Lincoln (1989) were utilized, as summarized in Table 2.

Analysis

For the quantitative data, the main analysis was a 2 (group) × 2 (time: baseline and post-intervention/3 months post-randomization for the waitlist group) repeated measures analysis of variance (ANOVA). Thus, the waitlist intervention group served as a control condition as they did not receive the intervention until after the 3-month, post-randomization assessment. Following the 3-month post-randomization period, the waitlist group began the intervention and thus, the groups' results were combined at each data point. To ensure this was appropriate (i.e. that the groups were comparable intervention groups), a between groups χ^2 test was conducted and no significant differences between group cessation rates were found at any of the time points ($p > 0.05$). Therefore, the secondary analysis was a repeated measure ANOVA over time for both groups combined at immediate, 3-, 6- and 12-month post-intervention. For the qualitative data, inductive content analysis, as described by Elo and Kyngas (2008) and Patton (1987), was conducted by two independent researchers who coded and categorized data based on emergent themes.

Results

Demographics

Participants in this study were typically undergraduate University students between 19 and 25 years (Mean = 23.72 years) and 65.0% were male. The majority of participants engaged in nine MI-via-CALC sessions (range: 7–10). Descriptive statistics of participants and self-report cessation at all five time points are presented in Table 1.

Main analysis

While the repeated measures ANOVAs revealed (for Pillai's Trace) several main effects for group and time, of primary interest are the group × time interactions. Regarding the number of cigarettes, there was a significant interaction, $F(1,38) = 6.787$, $p = 0.013$, partial $\eta^2 = 0.152$, revealing that the intervention group decreased their number of cigarettes smoked (Figure 1). The interaction was also significant for CDS, $F(1,38) = 9.002$, $p = 0.004$, partial $\eta^2 = 0.203$, with the intervention group, again, demonstrating a significant reduction (Figure 2). The interactions for all three of the personal competency variables also proved to be significant and the descriptive statistics for these are given in Table 3. The intervention group showed a trend increase in self-esteem, $F(1,38) = 4.000$, $p = 0.053$, partial $\eta^2 = 0.095$. There were also significant improvements in both internal and external self-efficacy for the intervention group, $F(1,38) = 9.002$, $p = 0.005$, partial $\eta^2 = 0.192$ and $F(1,38) = 14.053$, $p = 0.001$, partial $\eta^2 = 0.270$, respectively. Overall, these interactions demonstrate the intervention group had greater decreases in smoking behaviours (the number of cigarettes smoked per day and CDS) and greater increases in personal competence [self-esteem and internal and external self-efficacy (in terms of temptation to smoke)] compared with the waitlist intervention group over time.

Secondary analysis

To examine changes in smoking behaviours and personal competency over time following the administration of the intervention, both groups were combined, at the same time points and a repeated measures ANOVA was conducted comparing immediate post-intervention for the entire sample ($N = 35$) to 3-, 6- and 12-month post-intervention. For average number of cigarettes smoked per day, CDS, self-esteem and

Table 2. Data trustworthiness measures.

Measure	Implementation within the study
Credibility	Prior to the interview, honesty demands were utilized. To ensure participant comprehension of interview questions and interviewer's understanding of participant responses member checking was utilized throughout interviews. Interviews were audio-recorded and transcribed verbatim allowing participants' responses to be quoted.
Dependability	To reduce potential biases, rich descriptions of data protocol as outlined in this article are provided.
Confirmability	Inductive content analysis by two independent researchers for each time point was utilized to determine themes. Data was analysed simultaneously and subsequently compared and emergent themes were ratified.
Transferability	The research process and protocol has been described in detail thereby allowing others to determine the transferability of results to other settings and participants.

Source: Guba and Lincoln (1989) adapted from Irwin, He, Sangster Bouck, Tucker and Pollett (2005).

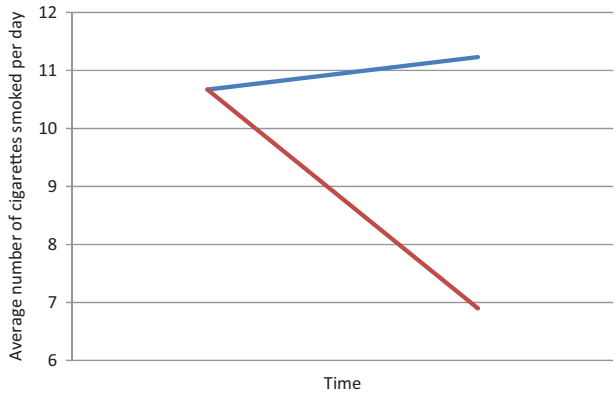

Figure 1. Change in number of cigarettes smoked per day for intervention and control groups.

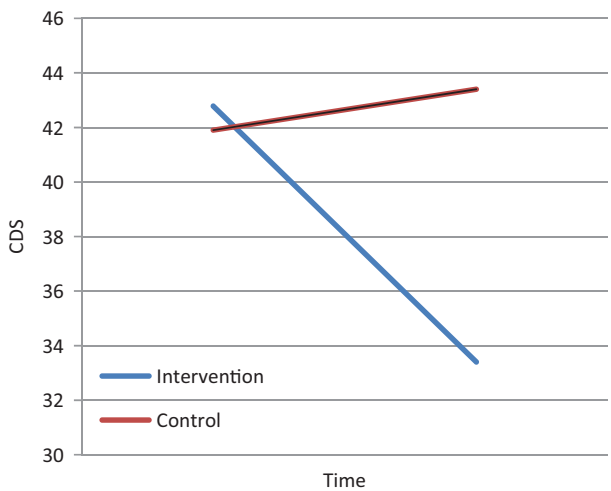

Figure 2. Change in CDS for intervention and control groups.

Table 3. Descriptive statistics for personal competency outcome measures at baseline and post-intervention for both groups.

Variable	Baseline		Post-intervention	
	Intervention Mean (SD)	Control Mean (SD)	Intervention Mean (SD)	Control Mean (SD)
Self-esteem[a]	20.32 (4.78)	21.38 (3.59)	22.98 (1.25)	21.38 (3.04)
Internal self-efficacy[b]	23.35 (3.75)	24.29 (3.67)	19.42 (4.23)	24.22 (3.29)
External self-efficacy[b]	25.62 (3.99)	25.01 (2.89)	19.89 (4.17)	25.81 (3.01)

[a]Higher scores denoted higher self-esteem.
[b]Lower scores denote increased self-efficacy to resist the temptation to smoke where internal refers to emotional temptations and external refers to environmental temptations.

internal self-efficacy, there was no significant effect for time ($p > 0.05$). However, with respect to external self-efficacy there was an effect for time, $F(1,38) = 3.070$, $p = 0.049$, partial $\eta^2 = 0.276$. Further analysis revealed external self-efficacy at immediate post-intervention ($M = 12.60$, $SD = 8.79$) was significantly lower compared to 3 months ($M = 15.14$, $SD = 7.91$; $p = 0.011$), 6 months ($M = 14.10$, $SD = 7.97$; $p = 0.031$), and 12 months ($M = 14.90$, $SD = 8.78$; $p = 0.026$). This does not necessarily indicate that gains in resisting temptations to smoke from the environment were not maintained, but rather that individuals experienced greater environmental temptations to smoke from post-intervention to 12-month follow-up.

Cessation and biochemical verification

At 3-month follow-up, 10 participants from the immediate intervention group reported being smoke-free compared with zero participants from the waitlist-intervention group (who had not yet received the intervention). This finding was expected as no intervention had been introduced for the waitlist group. Moreover, at 3-month post-intervention, when both groups had completed the intervention and their data were merged for analysis, an additional nine participants (from the waitlist-intervention group) reported being smoke-free. This meant, a total of 19 participants were smoke-free immediately following their completion of the intervention. At 12-month follow-up at post-intervention for both groups combined, 11 participants reported being smoke-free and cotinine saliva tests were obtained for nine of these participants. Moreover, cessation reports were consistent with a cotinine saliva test for all nine participants. One participant who claimed cessation lived with four heavy smokers and because the cotinine levels were in line with this situation, cessation status was accepted. Similarly, one participant claimed to be smoke-free for only 2 d. Again, the cotinine levels were reflective of this reality and this participant's self-report was accepted. As the cotinine saliva tests were consistent with all participants' reports two living outside of the province and unable to provide a saliva sample were deemed to have provided accurate information also (Table 4).

Table 4. Cotinine saliva test results at 12-month follow-up.

Smoke-free individual	Test 1	Test 2	Mean (ng/mL)	Significance
1	1.32	1.27	1.29	SF
2	18.68	18.61	18.65	SF; lives with four heavy smokers
3	1.21	1.25	1.23	Smoke-free
4	266.87	233.10	249.98[a]	SF; Quit 2 d earlier
5	1.24	1.77	1.50	SF
6	0.04	0.18	0.11	SF
7	0.27	0.21	0.24	SF
8	0.34	0.29	0.32	SF
9	1.45	1.30	1.37	SF

<15.00 ng/mL denotes cessation.
[a]This participant was a previous heavy smoker who had quit 2 d earlier and lived in a house with four other smokers.

Qualitative data

Qualitative findings for all time points were categorized broadly into four themes: (1) identity, encapsulating the changing relationship among identity/smoking and self; (2) smoking, highlighting changes in various aspects of smoking behaviour; (3) quitting, encompassing changes resulting from cessation attempts and (4) intervention, consisting of participants' perceptions of their participation in MI-via-CALC intervention. More specific themes at each time point are presented below.

Baseline

There were six themes derived from baseline interviews; these contextualized participants' understanding of their relationship with smoking/cigarettes and underscored past issues and future needs for cessation. The first theme ''smoking and identity'' stressed smoking not only as a behaviour but also as a component of identity. The second theme ''smoking as a coping mechanism'' highlighted the use of cigarettes to deal with negative emotions such as stress, anger and anxiousness. With respect to ''smoking as a social experience'' participants underscored the easily forged social bonds through smoking as a mutual behaviour. Additionally, many participants identified ''smoking and control'' as problematic, in particular, the realization of loss of control over smoking or the insight that the perception of being in control of smoking was an illusion. Regarding past cessation attempts, many ''stumbling blocks to quitting'' were identified, such as procrastination, or the idealization of the spontaneous emergence of the ''right'' day to quit. Finally, ''what I need to quit'' was identified and entailed personal competency, motivation and unwavering support. Illustrative quotations supporting each theme are presented in Table 5, with the number of participants who reported each theme in brackets.

Table 5. Quotations illustrating baseline themes.

Themes
Identity
Smoking and identity ($n = 22$)
''[Smoking] is part of my identity . . . I've smoked for over half of my life . . ..''
''There are two different versions of me, a version that smokes and a version that doesn't.''
''[Smoking] it is who I am and what I do . . ..''
Smoking
Smoking as a coping mechanism ($n = 25$)
''When I don't do well I want to smoke . . . if I'm stressed I want to smoke''
''[Smoking] is kind of a safety net . . . it really relieves me when I'm upset, when I'm angry, when I'm anxious or nervous . . ..''
''[Smoking] is just an escape . . . when things are all screwed up and everything is going wrong, I have a cigarette.''
Smoking as a social experience ($n = 32$)
''[Smoking] is part of the way I interact with people.''
''I've met a lot of good friends through smoking.''
''. . . the first thing I did when I came to University was went outside and looked for someone who was smoking and that was how I made friends.''
''Smoking brings people together; you know it makes strangers talk.''
Smoking and control ($n = 19$)
''I really don't know whether or not I can control myself [when it comes to smoking].''
''I thought I was totally in control of smoking . . . but I know that I'm addicted now.''
''. . . something the size of my pinkie really controls me.''
''Sometimes I feel that [smoking] is the one thing that, as ironic as it sounds, . . . that I can control whether I smoke or don't smoke; however, that is juxtaposed by the fact that I can't quit.''
Quitting
Stumbling blocks to quitting ($n = 21$)
''I tell myself 'I'll do it tomorrow' . . . I'm constantly putting [quitting] off.''
''I tell myself that I'll quit once I have kid or get married or something.''
''I've always told myself when I have more freedom, and when I don't have to work I will quit.''
''I tell myself it is like one magical day, I'm going to wake up and I'm not going to have the urges . . . but I know that won't happen.''
What I need to quit ($n = 17$)
''I think I need to believe in myself.''
''. . . self-discipline and motivation.''
''. . . will power and determination.''
''If I was 100% certain that I could expect, not that I deserve it, but expect some support through the [quitting] process I think that would help.''

Immediate post-intervention

Five themes emerged during post-intervention, with ''smoking and identity shift'' reflecting both the realization of addiction as a part of participants' identity and the need to create a new non-smoker identity. ''Increased personal competency'' was prevalent and participants expressed feelings of empowerment and increased self-worth. Participants also realized ''smoking is a choice'' and the power of shifting from smoking as a habit to making a conscious decision. Participants also identified several tailored ''quitting strategies'' and despite the vast differences in execution, the underlying purpose was to either avoid smoking or promote continued cessation. Furthermore, there was an overwhelmingly positive attitude about the ''impact of coaching'' with participants highlighting beneficial elements of MI-via-CALC such as support, value clarification and championing of successes. Quotations illustrating each theme are presented in Table 6.

Three-month follow-up

During the 3-month follow-up interviews, five themes emerged. ''Learning about myself'' was a salient theme encapsulating self-realization and participants' journey to both better self-understanding and being gentler with themselves. A continued theme from immediate post-intervention was ''increased personal competency'' with the associated impact on participants' lives beyond smoking/quitting. Participants also gained insights into underlying reasons for smoking as described in the ''learning why I smoke'' theme. Moreover, there was ''increased awareness about quitting'' underscoring the appreciation of the intensity of the quitting processes and the perceived need for a psychological shift. The ''impact of coaching'' continued to be underscored by participants with living true to values, gaining/changing perspectives and accountability being highlighted as behaviour change assets. Illustrative quotations for each new theme are presented in Table 7.

Six-month follow-up

During the 6-month follow-up interviews, three themes re-occurred and two new themes consistent with the broad categories emerged. There was continued ''learning about myself'' for participants regarding understanding their addiction and triggers. ''Increased personal competency'' continued to be prevalent and participants described an overall feeling of empowerment and a new belief in their ability to succeed. ''Fear of failure'' was identified as a significant obstacle to trying to quit by participants who continued to smoke. Additionally, several participants highlighted ''life changes along with quitting''; these encompassed the drive for a healthier lifestyle and the need to live true to personal values. Finally, the ''impact of coaching'' was reiterated with participants' continued identification of the strength of changing perspectives to facilitate behaviour change.

Table 6. Quotations illustrating immediate post-intervention themes.

Themes
Identity
Smoking and identity shift ($n = 23$)
''I learned I'm truly an addict, and I can't just smoke casually ever anymore.''
''[Quitting] means a whole new identity . . . being a non-smoker means I have a new identity.''
''[Smoking] really is a part of you, but you have to realize that in order to quit.''
Increased personal competency ($n = 25$)
''I feel so much more empowered.''
''I have become a stronger person that I respect and value, there are things that I want for myself now in the future.''
''I feel great knowing that I have the mental strength to overcome adversity.''
''I was really down on myself for smoking, but now my sense of self-worth is higher I mean whatever, I [feel I] can take over the world!''
Smoking
Smoking is a choice ($n = 24$)
''I just realized there is no need for [smoking], so [I am] making the decision that I no longer want to.''
''I learned that [quitting] is definitely a possibility . . . I'm not a prisoner of cigarettes.''
''My mind-set shifted, I realized that I don't need to smoke, it is a choice.''
Quitting
Quitting strategies ($n = 26$)
''[My coach and I] came up with a lot of strategies [to help me quit], like a playlist for when I have the urge to smoke.''
''I'm trying new activities, to help me avoid smoking . . . I started playing squash.''
''I'm learning to rely on family and friends for support to help me quit.''
''Instead of avoiding the addiction or craving, I focus on it, you know kind of like mentally attacking it.''
Intervention
Impact of coaching ($n = 31$)
''Speaking with someone else about [smoking] and him/her not having any judgement was really beneficial.''
''[Coaching] gets the mind thinking about what it really wants.''
''[My coach] helped me to take the time and give myself credit for everything I have accomplished . . . it was nice to have somebody who was dedicated to my success.''

Table 7. Quotations illustrating 3-month follow-up themes.

Themes
Identity
Learning about myself ($n = 22$)
''I learned that I'd been cutting myself short.''
''I'm more inclined after [coaching] to look at something I want with my life and say, okay, what are the steps I have to do and it's doable.''
''My experience with [my coach] made me more self-aware.''
''I learned not to be too hard on myself and to give myself some down time.''
Smoking
Learning why I smoke ($n = 23$)
''I'm more aware of how much I smoke and why I smoke.''
''I wasn't aware of some problems and those are the reasons I smoke, so after talking with the coach, we identified those problems and I was able to quit and no longer rely on smoking.''
''I needed to wrap my mind around why I always gave into something that I didn't ultimately want to do.''
Quitting
Increased awareness about quitting ($n = 27$)
''I tend to make things a bigger deal or a bigger obstacle than they actually are and with the coach I put that into perspective.''
''I learned to take it not even a day at a time, but an hour at a time.''
''It's just you, like you make the decision to smoke or not.''

Illustrative quotations for each new theme are presented in Table 8.

Twelve-month follow-up

During the 12-month assessment there were three reoccurring themes and two new themes. As previously highlighted, participants described personal accountability, greater self-awareness and believing in themselves in the ''learning about myself'' theme. Participants further underscored ''increased personal competency'' not only related to smoking but also the associated impact on other areas of their lives. ''Social temptations'' were highlighted as the most significant barrier to quitting and remaining smoke-free and typically consisted of alcohol consumption with peers. Participants noticed a ''change in relationship with smoking''. In this regard, they describing a shift from a reliance on cigarettes as a coping mechanism to the realization that smoking cigarettes was simply a detrimental coping strategy. Moreover, the ''impact of coaching'' was reiterated as a positive transformational experience and the importance of goal setting and perspectives were highlighted as key tools that facilitated success. Illustrative quotations for each new theme are presented in Table 9.

Table 8. Quotations illustrating 6-month follow-up themes.

Themes
Smoking
Fear of failure ($n = 12$)
''I realize I sound like a real egotistical person but I'm fairly success driven . . . I like to succeed and I'm afraid I can't [quit].''
''It's almost like it's too hard, so why try. I don't think I will be able to do [quit].''
''I still really want [to quit] but I don't know if I can.''
Quitting
Life changes along with quitting ($n = 13$)
''I'm more dedicated to a healthier lifestyle, not just quitting smoking but eating better, exercising more and just focusing on what is important in my life.''
''I learned I have a strong set of values and beliefs and how to speak for myself.''
''I've applied [the coaching] to other parts of my life as well and it has been really positive.''

Table 9. Quotations illustrating 12-month follow-up themes.

Themes
Smoking
Social temptations ($n = 18$)
''My biggest challenge was definitely being around friend when I go to the bar.''
''It was hard to overcome smoking while I was drinking.''
''My biggest temptation [for smoking] is always when I'm drinking with friends.''
Quitting
Change in relationship with smoking ($n = 22$)
''My biggest success was convincing myself that I don't need to smoke.''
''Now, I know I can quit, I don't need [smoking] to cope with stress.''
''I don't idealize cigarettes anymore, because they aren't helping me deal with stress or make friends, they are just hurting me.''

Not surprisingly, across all time points, a general and consistent theme emerged in that those participants who were smoke-free at any given time point were more positive and effusive about their perceptions of coaching. Insights and perceptions pertaining to the other themes did not vary based on smoking status over time.

Discussion

The purpose of this study was to assess the impact of MI-via-CALC on: smoking behaviours, personal competency and perceptions of identity, smoking, quitting and the intervention itself among young adults. The results of this longitudinal MI-via-CALC study found a significant reduction in smoking behaviours and increased personal competency among young adults in the immediate-intervention compared with the waitlist-intervention group. Specifically, smoking behaviours, including number of cigarettes smoked per day and CDS scores, were reduced significantly and personal competency in terms of self-esteem and self-efficacy both improved significantly for the immediate intervention group from baseline to post-intervention, while these variables did not change for the waitlist-intervention (while it was serving as the 3-month control condition). These significant findings, specifically related to personal competence, self-esteem and self-efficacy are well-documented important predictors of attempting and sustaining future cessation attempts (Cohen et al., 1989; Kowalski, 1997; Matheny & Weatherman, 1998; Mothersill et al., 1988; Ockene et al., 1982). Together, these psycho-social constructs represent smokers' confidence and belief in themselves – that they can achieve their cessation goals. Thus, enhancing these constructs is also likely to enhance their likelihood to try to quit and stay smoke-free.

There were no significant differences in average number of cigarettes smoked per day, CDS, self-esteem and internal self-efficacy from immediate post-intervention to 3-, 6- and 12-month post-intervention assessment for the combined sample; however, there was a significant increase in external self-efficacy, denoting an increase in temptation to smoke from environmental triggers. It may be of interest to note that due to a small percentage of the sample dramatically increasing their smoking habits while other quit, the number of cigarettes smoked per day stayed the same even though the cessation rate dropped. Qualitative assessments were consistent with the quantitative findings in that the assessments illuminated that participation in this study resulted in helping to deal with triggers together with changes in re-shaping identity, increasing personal competency, altering perceptions of smoking behaviours and quitting behaviours, as well as the overwhelmingly positive experience of participating in the intervention. Environmental triggers, such as certain social situations or alcohol and coffee consumption, represent a challenge for many smokers trying to quit, and Krukowski, Solomon and Naud (2005) found that although the type sometimes varied, environment triggers themselves were a major issue among college students who were both light and heavy smokers. It is clear that environmental triggers are an issue that require further research focus and future work in this area could expand on this study with an increased focus on MI-via-CALC's utility in specifically addressing environmental triggers. Although there were no noticeable differences in qualitative themes – other than positive perceptions of coping – based on smoking status at any time point, it is possible that each participant's shift in personal competencies facilitated the action of quitting smoking at a different rate based on the other competing, contextual factors. Whereas participants may have some personal competencies in common on their cessation journey, they may also have individualized, additional reasons for smoking/quitting, which could impact their personal state of readiness to change. This possibility would be valuable to explore further in a future larger study where participant numbers could lend themselves to a sub-analysis of qualitative themes by smoking status.

A main study finding was the 1-year follow-up cotinine-verified 27.5% cessation rate. As this rate is so much higher

than most reported smoking cessation rates, it is essential both to underscore the finding as well as to discuss the reasons the rate is so comparatively high. In a Cochrane review, Stead, Perara, Bullen, Mant and Lancaster (2008) suggest a research-based consensus that an approximation of the quit rate with pharmacotherapy shown in most smoking cessation studies – whether NRT interventions, other medications such as antidepressants, lozenges, gum, clinician-assisted (physician, dentist) and/or some combination of these and other interpolations – is around 15%; if some form of behavioural support coincides with the pharmacotherapy treatment, then the reported cessation rate is about 23%. In the same vein, the 27.5% cessation rate of this intervention at 12-month follow-up was comparatively much higher than other MI interventions which ranged from 5% to 18%, with a weighted average of 11.5% (Lai et al., 2010; Soria et al., 2006; Wakefield et al., 2004). Some MI interventions have reported higher cessation success rates, specifically as high as 35% (Dornelas, Sampson, Gray, Waters, & Thompson, 2000); however, unique to this study was the intervention group consisted of individuals who were in-patients at a hospital for myocardial infarctions (Dornelas et al., 2000), arguably a co-morbidity with a notable impact on an individual's motivation to become smoke-free. With respect to comparisons with other MI interventions, this study utilized MI-via-CALC; the latter is a very specific way to apply the tenets of MI and was done via professional, certified coaches; whereas other MI approaches might have utilized minimally trained MI personnel and/or demonstrated a considerable variability in the manner of applying the principles of MI. MI-via-CALC may offer a standard protocol of the intervention across all participants, although a study on the fidelity of the approach during the treatment condition is needed to verify this possibility. In comparison with the established quit rates of 15–23% in most studies, the 27.5% demonstrated in this intervention, at the very least, would point toward the potential impact of using MI-via-CALC as a primary intervention in more cessation studies as well as to the more salient implication for the vast majority of smokers who do want to quit and the concomitant health amelioration benefits. We suggest that, in part, the underlying reasons for our 27.5% success rate stem from the fact that MI-via-CALC allows participants to deal with the underlying causes of their smoking behaviour (stress, social choices, etc.) and not merely with the act of smoking itself – smoking is about so much more than smoking itself. This interpretation is consistent with both our quantitative and qualitative findings concerning significant decreases in smoking behaviours and escalations in personal competency. This notion is contained within a variety of other counseling approaches and helps to illumine the improved quit rates when behavioural support is combined with pharmaceutical tools. However, there appears to be something unique and promising about MI-via-CALC, given the substantial quit rate over previously reported studies. Another reason the cessation rate is so comparatively high may be that only participants willing to set a quit date within the next 4 weeks were recruited for this study. As such, it would be of value to advance this line of investigation via future studies dedicated to exploring more specifically what takes place during the MI sessions themselves; what transpires during those sessions is very likely linked to the improvements in smoking behaviours as well as recruiting a wider range of participants into the study.

The study findings were consistent with and expand on results from the previous MI-via-CALC demonstration study (Mantler et al., 2010), even though this study was limited by the lack of a control group and found only positive trends (due to a small sample size). Thematically, prevalent qualitative findings in the demonstration study such as smoking and identity, smoking and control, barriers to quitting and the positive impact of the MI-via-CALC were reiterated in this study. Of specific interest is the parallel finding of the maintenance of significant behaviour change and cessation rate at 1 year after follow-up. Once again, this along with the statistically significant differences between the immediate- and waitlist-intervention groups underscores the powerful impact of MI-via-CALC at facilitating cessation.

The need for continued evaluation of MI-via-CALC along with the identification and improvement of study limitations would further enhance this research protocol. Limitations include: lack of intervention implementation information, attrition, limited age range limited follow-up for waitlist group (i.e. 3 months only) and all individuals recruited to the study wanted to and were willing to commit to quit smoking in the next 4 weeks. Furthermore, whereas the current study included 8–10 sessions, other MI studies often include fewer sessions and therefore, future studies should explore the ideal number of sessions to optimize sustained cessation. The content of the MI-via-CALC intervention, beyond adherence to the CALC model, was outside the scope of this study but merits investigation to ensure fidelity. The attrition rate for this study was high, 25%, but consistent with both similar smoking cessation studies and the finding that attrition is more common among young adults aged 15–29 years (Borland, Segan, Livingston, & Owen, 2002; Risser & Belcher, 1990). Moreover, the limited age range of this study affects generalizability of results. Replicating this study with a broader smoking population would likely overcome both attrition concerns and allow for increased generalizability of results. Moreover, due to logistical challenges, we had a limited follow-up for the waitlist-intervention (group 2) portion of this study which resulted in an inability to ascertain if changes observed in the intervention compared with waitlist condition were maintained over time. Future studies should implement a true control group to match the intervention group. Another limitation meriting discussion was all individuals recruited wanted to and were willing to commit to quit smoking in the next 4 weeks, which has implications for generalizability of the study findings. Furthermore, although a small portion of subjects in the current study chose NRT as a result of their MI-via-CALC sessions, future studies should overtly compare MI-via-CALC with and to NRT (this study design did not allow for any MI-via-CALC versus MI only comparisons due to insufficient power for this statistical model).

Participants themselves offered suggestions to enhance the acceptability of the MI-via-CALC intervention. First, several participants expressed the desire for a tapered end to the intervention and tailoring around session number and length. These changes would allow the intervention format to be

more reflective of the client-centredness of MI-via-CALC method. Finally, the timing and length of the intervention, despite coinciding with well-documented times of interest for cessation, namely September and January, resulted in the MI-via-CALC sessions ending around final examinations for participants. This was especially problematic given the large number of university students within the study and the high stress associated with examinations. Future studies should look at increasing the number of sessions so the intervention ends at a low stress time in participants' lives to promote better success.

The implications of MI-via-CALC for standard care, for frontline health care workers and for research are driven by the success of the intervention coupled with the clear need for more efficacious cessation strategies (Lavack & Clark, 2007). Standard care, in terms of availability of cessation strategies, for the most part, are limited to NRT, the Smokers' Helpline and self-help interventions. The reality of the success of these three standard care interventions is 10–15% cessation (Etter & Stapleton, 2006; Lai et al., 2010; Lancaster & Stead, 2005). The considerably higher cessation rates of MI-via-CALC both for this study and the previous demonstration study underscore the need to integrate MI-via-CALC into current individual cessation strategies. There is a need for frontline health care workers to be provided with training that can help them to examine and encourage smokers to utilize the most efficacious strategies, that most suits them, to facilitate change, given the immense difficulty associated with achieving cessation. Currently, intensive MI-via-CALC interventions are accessible only to participants in research studies or by those who pay out-of-pocket to work with an interventionist. Providing a modification of MI-via-CALC training (training in basic concepts and skills, not full certification) to health practitioners already working with smokers who are covered by the smoker's health care insurance system would provide greater access to MI by more smokers seeking to quit. In the same vein, it would be important for future studies to evaluate how different levels of MI-via-CALC training could be integrated into front-line workers' continuing education offerings along with the effectiveness of that training in bringing about health behaviour changes. There is a need for continued research, to investigate both the benefits of MI-via-CALC in relation to standards of care and to extend this intervention to a broader population of smokers. Next, steps should also include creative strategies to using and evaluating the MI-via-CALC approach in population-based interventions. There is a need to extend these findings into both frontline health care practices and research protocols, because MI-via-CALC offers a theoretically grounded, practical and efficacious cessation strategy for smokers.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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