# Online motivational interviewing counselling approach to reduce tobacco use

**Summary of PhD thesis**

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# List of publications

## 1. List of full papers directly related to the subject of the thesis

**I.** **Pócs D,** Adamovits O, Watti J, Kovács R, Kelemen O. Facebook Users' Interactions, Organic Reach, and Engagement in a Smoking Cessation Intervention: Content Analysis. Journal of Medical Internet Research. 2021 Jun;23(6):e27853. [IF: 5,034, D1 - 2019]

**II.** **Pócs D**, Kovács R, Óvári T, Erdős C, Kelemen O. Tobacco reduction on Facebook among 14–35-year-olds [A dohányzás visszaszorítása a Facebook segítségével a 14–35 éves korosztály körében]. Orvosi Hetilap. 2019 Feb;160(6):220-227. [IF: 0,497, Q3 - 2019]

**III.** **Pócs D**, Hamvai Cs, Kelemen O. Health behavior change: motivational interviewing [Magatartás-változtatás az egészségügyben: a motivációs interjú]. Orvosi Hetilap. 2017 Aug;158(34):1331-1337. [IF: 0,322, Q4 - 2017]

**IV.** **Pócs D**, Barabás K, Kelemen O. Interventions in medical practice to reduce tobacco use among adolescents [Intervenciók az orvosi gyakorlatban a serdülőkori dohányzás visszaszorítására], Orvosi Hetilap. 2018 Apr;159(15):593-602. [IF: 0,564, Q3 - 2018]

**V.** **Pócs D,** Óvári T, Watti J, Hamvai Cs, Kelemen O. How to create Social Media Contents based on Motivational Interviewing Approach to support Tobacco Use Cessation? A Content Analysis. Journal of Substance Use, 2021, under review.

Cumulative impact factor of papers directly related to the subject of thesis: 6,417.

## 2. Other full paper

**Pócs D**, Siklósi R, Nyári T, Barabás K. Egészségügyi félelmek: epidemiológia és prevenció 5-6 éves gyermekek körében [Medical fears: Epidemiology and prevention of 5-6 years old children]. Lege Artis Medicinae 2013; 23(1): 28-36. [IF: -, Q4 - 2013].

**Total cumulative impact factor: 6,417.**

# Summary

**Background and purpose:**

In this work, we assessed a smoking cessation intervention, which applied the motivational interviewing (MI) approach and targeted 14–35-year-old smokers on Facebook (FB). Our 1st research aimed to analyse the potential effects of this intervention on the target group's smoking habits, smoking cessation knowledge and attitudes. Our 2nd research sought to identify which types of social media content could achieve positive differences in the target population's interactions. Finally, our 3rd research highlighted how FB users' interactions correlate with the reach and engagement of the intervention.

**Experimental approaches:**

In the 1st research, we collected data using an online questionnaire among 14–35-year-old FB page followers (N=332). In the 2nd research, we categorized FB posts (N=701) into different groups according to MI strategies (study group) and other techniques (control group). Outcomes were content reach, FB users' interactions, and smokers' motivational language. In the 3rd research, we analysed smoking cessation support contents (N=1025) to assess the correlations between FB post data (reach, interactions, engagement).

**Key results:**

Smokers who visited the FB page more frequently or for longer duration reported that their self-confidence about quitting significantly increased ($p<.05$). Social media contents which used MI strategies were associated with significantly more positive interactions ($p<.05$) and more motivational utterances about cessation ($p<.001$), compared to the control group. Lastly, 'like' reaction was sharply separated by significant negative correlations from organic reach, negative FB interactions, 'wow', 'sad', 'angry' reactions, and comments ($p<.001$).

**Conclusions:**

We found that using MI approach in an internet-based smoking cessation intervention seems to stimulate positive interactions with young smokers, change their cessation knowledge and attitudes, and support their motivational language about smoking cessation. Primary FB-based public health interventions could gain benefits from our results; however, further research should be conducted to investigate the use of MI strategies in other online platforms.

# 1. Introduction

## 1.1. Epidemiology of tobacco use among 14–35-year-olds

The age-specific smoking prevalence gradually rises and peaks among 15–34-year-olds, and then slowly decreases in the older age groups. It is well known in the literature that shorter duration of smoking is associated with an increased chance of a successful cessation attempt. This predicts higher cessation efficiency among adolescents and young adults. Nevertheless, cessation attempts are less frequent among 15–34-year-olds compared to older age groups.

## 1.2. Overview of smoking cessation management among adolescents and adults

Many differences can be identified between adult and adolescent smoking, which are essential in medical practice. Firstly, adolescents tend to try and use two or more tobacco products. Secondly, adolescents are susceptible to misconceptions about the use of tobacco products. Thirdly, instead of chronic diseases, adolescent smokers are more sensitive to the short-term effects of smoking. Fourthly, various smoking cessation programs and pharmacological treatments are proposed for adults and adolescents. Finally, adolescent smoking is characterized by progression.

## 1.3. Treatment options of tobacco dependence

Tobacco dependence is a substance use disorder, which has two components: physical and psychological dependence. Physical dependence (nicotine addiction) is caused by nicotine, and it is treated with pharmacological agents. Psychological dependence can develop when tobacco use is associated with daily routine, social contacts, and situations, and this behaviour sustains dependence. Treatment includes behavioural therapy to address routines and triggers associated with an individual’s tobacco use. Two effective counselling approaches for managing psychological dependence are supported by evidence: cognitive-behavioural therapy and motivational interviewing (MI).

## 1.4. Motivational interviewing as a counselling method

MI is a person-centred, goal-oriented counselling method designed to help people change their health behaviour. MI combines different counselling methods used in psychological and psychiatric practice. The client has an active role, because MI-based counselling is aimed at evoking the client's motivations. The communication style of the MI approach is based on the development of collaboration ('guiding' style). The literature refers to the following characteristics as the 'Spirit of MI': partnership, acceptance, compassion, and evocation.

### 1.5. The ‘Spirit of Motivational Interviewing’

Partnership suggests that the physician functions as a partner, collaborating with the client’s own expertise. Acceptance means that the physician recognizes and communicates the client's values, feelings, autonomy, strengths, and efforts. Compassion highlights that the physician promotes the client’s welfare, giving priority to the client’s needs. Evocation suggests that the physician elicits the client’s own perspectives and motivations.

### 1.6. General principles of the motivational interviewing approach

Four principles were compiled to provide a kind of framework, called ‘RULE’. The 'Resist the righting reflex' principle means that the partnership is more important than the physician's natural desire to set things right. 'Understanding your client’s motivation' suggests that the motivation comes from the client, not from the physician. 'Listen to your client' highlights that listening in MI is an active process. Lastly, the 'Empower your client' principle suggests that physicians can never question whether clients are capable of behaviour change.

### 1.7. Basic skills in motivational-interviewing-based counselling

Based on these core principles, certain basic skills were created: open question, affirmation, reflection, and summary (OARS). Open-ended questions require more attention, but they make it easier for the clients to express their own motivations. Affirmation emphasizes the client's real and concrete positive efforts or behaviours. Reflection expresses what the client is saying, especially the meaning of the sentences. The summary is a special reflection which expresses the meaning of a longer conversation and aids behaviour change.

### 1.8. Relational and technical strategies during motivational interviewing

Relational strategies focus on strengthening the doctor-patient relationship and utilizing well-known and widely used methods in psychological practice, such as active listening or conflict management methodology. However, technical strategies are based on a new, specific hypothesis of the MI approach, which suggests that the client's motivational language could predict behavioural outcomes. The client's motivational language is basically divided into two groups: 'change talk' and 'sustain talk'. Change talk is any client speech that favours movement toward the behaviour change, in contrast to sustain talk, which is the verbalization of status quo and cons for behaviour change. Sustain talk could be associated with negative behavioural outcomes, while change talk could be linked to positive behavioural outcomes. Seven subtypes of change talk and sustain talk are distinguished: desire, ability, reason, need (DARN) and commitment, activation, taking steps (CAT). The aim of technical MI strategies is to 'cultivate change talk' and to 'soften sustain talk'.

# 2. Goals of the thesis

## 2.1. Gaps in current knowledge

As we mentioned it before, the prevalence of smoking gradually rises and peaks among adolescents and young adults. At the same time, cessation attempts are less frequent, but more successful in this age group compared to over 35-year-olds. This could be a reason why the investigation of age-specific tobacco reduction interventions is so important. During the review of the Hungarian literature, we could not find any studies dealing with internet cessation support. This is still a field to be researched in Hungary. Finally, little is known about how MI-based social media contents are associated with internet users' interactions. The present thesis seeks to fulfil these gaps.

## 2.2. Primary focuses of the research

Our 1st research sought to reveal the potential effects of the investigated Hungarian Facebook (FB) page on the target group's smoking habits, smoking cessation knowledge and attitudes. Our 2nd research aimed at identifying which types of intervention content could achieve positive differences in the target population's interactions (social media contents with and without MI strategies). Finally, our 3rd research highlighted how FB users' interactions correlate with the reach and engagement of the intervention.

## 2.3. Specific aims of the present work

### *2.3.1. Analysis of the target population's habits, knowledge, and attitudes (1st research)*

The main aim is to evaluate the advantages of the Hungarian FB page in changing the followers' habits, knowledge, and attitudes. The hypotheses are:

- Smokers who visit the FB page more frequently will report significantly more positive changes in habits, knowledge, and attitudes.
- Smokers who are following the FB page for a longer period of time will report significantly more positive changes in habits, knowledge, and attitudes.

### *2.3.2. Analysis of intervention contents and delivery (2nd and 3rd research)*

The main aim is to assess the usefulness of online MI strategies, and the correlations between special FB post data. The research questions are:

- How do MI strategies affect engagement rate, fan–total reach ratio, negative feedback, change talk and sustain talk, compared to the control group?
- What is the relationship between reach, engagement, and FB interactions on a post level during a smoking cessation intervention?

# 3. Materials and methods

## 3.1. The investigated FB-based smoking cessation intervention

The ‘Cigarette break’ FB page (www.facebook.com/cigiszunet) is a public Hungarian FB-based smoking cessation intervention. This intervention has adopted the ‘MI spirit’ and is trying to use MI adherent strategies in post creation. Accordingly, empathetic, collaborative, and motivational contents are used on the FB page, while discriminative and frightening contents are avoided. Students, educators, and the author of the thesis manage the FB page and create social media contents within the framework of a university course by the Department of Behavioural Sciences, Faculty of Medicine, University of Szeged.

The intervention had 3,278 page-likes at the time of the 1st research (on June 27, 2018). FB fans were 49% female and 51% male. The investigated FB page had 5,935 page-likes when data for the 2nd research period were extracted (on March 23, 2019). In all, 54% were female and 46% were male. Finally, the intervention had 10,098 page-likes at the time of the 3rd research (on August 14, 2020). FB fans were 53% female and 47% male. The mean age of the FB fans was between 26-28 years in 1st, 2nd, and 3rd research. In the investigated three-year period, more than 1,000 intervention contents were made. A significant part of these contents (approximately 20-30%) was compiled by the author of the thesis, and he also supervised the creation of all other contents.

## 3.2. Analysis of target population’s habits, knowledge, and attitudes (1st research)

### *3.2.1. Participants*

We collected data using an online questionnaire over a two-week time interval (June 24, 2018 to July 8, 2018). A total number of 358 responses was received. We included internet users who followed the investigated FB page. The youngest participant was 14 years old. We excluded those who were 36 years of age or older. Therefore, 332 responses were analysed (N=332), and the participants were in the 14–35-year-old age group.

### *3.2.2. Design and procedure*

An online survey seemed to be a good opportunity to reach internet users who are following of the investigated FB Page. A common method of social media research is the usage of FB advertising and sweepstakes, which we also applied. The language of the questionnaire was Hungarian. The participation was voluntary, based on informed consent. We reached anonymized data from the Goggle company using ‘Google Forms’ software.

#### *3.2.3. Online survey*

At the beginning, demographic characteristics were explored (e.g., gender, age, place of residence). Furthermore, we measured the frequency and the duration of exposure to the investigated FB page. In the next step, participants were classified according to their smoking status: non-smokers, former smokers, and smokers. Among smokers, we assessed the participants' habits, knowledge, and attitudes about tobacco use and smoking cessation (e.g., smoking frequency, nicotine dependence, motivational stages of smoking cessation). Among former smokers, we examined the cessation support effect, and the relapse prevention effects. Among non-smokers, we examined the positive changes in attitudes: smoking cessation support and self-protection from second-hand smoke.

### 3.3. Analysis of intervention contents and delivery (2nd and 3rd research)

#### *3.3.1. Intervention contents and control group*

Firstly, the content analysis of the 2nd research is presented. Social media content data posted on FB between March 7, 2017 and March 7, 2019 was analysed. We made 816 posts in these two years. In all, 115 FB posts were excluded: 55 administrator's posts, 6 boosted FB posts, 7 MI non-adherent contents, 47 non-cessation social media contents. Therefore, we included 701 posts (N=701). Social media contents which used MI strategies formed the study group: four technical MI strategies (‘elaborating change talk’, ‘affirming change talk’, ‘reflecting change talk’, and ‘softening sustain talk’), two relational MI strategies (‘building partnership’ and ‘expressing empathy’). FB posts which did not use MI strategies but followed the MI spirit formed control group (‘entertaining’ and ‘giving information’ strategies). The included contents were classified separately by four raters into these 8 categories (Fleiss kappa value of 0.860).

Secondly, the content analysis of the 3rd research is shown. In all, 1269 social media contents were made between March 7, 2017 and August 14, 2020. We excluded 244 FB posts following the exclusion criteria: 69 administrator's posts, 60 boosted FB posts, 7 MI non-adherent contents, 84 non-cessation social media contents, and 24 video posts. After exclusion, 1025 original posts were included (N=1025), which all followed the spirit of motivational interviewing, supported smoking cessation, were targeted at smokers, and did not use specific advertising. We did not use any other classification of the intervention contents in the 3rd research. FB users’ different interactions given to the same stimulus were evaluated. The stimuli were smoking cessation support contents on a public Facebook page, regardless of the MI strategy used.

### *3.3.2. Primary outcomes*

Specific FB post data were used as primary outcomes. This database contains anonymized and aggregate data; that is why, FB users cannot be identified. We analysed 'multiple post data' in the 2nd research: engagement rate, negative feedback, and fan–total reach ratio. The engagement rate was calculated by dividing the number of reactions, comments, shares, and clicks by the total organic reach (the number of people who saw the non-paid post). The total number of negative FB interactions is negative feedback (e.g., post hides or unlike of page). The fan–total reach ratio was calculated by dividing fan reach (the number of fan FB users who had liked the FB page before they saw the post) by the total organic reach. In the 3rd research, 'separate post data' were assessed: fan reach, non-fan reach, reactions (e.g., 'love' or 'sad'), shares, comments, clicks, and negative FB interactions.

### *3.3.3. Secondary outcomes*

The FB users' initial comments were analysed to identify MI comments (change talk, sustain talk, DARN language, and CAT language), which were the secondary outcomes in the 2nd research. Only initial comments on the FB page's original posts were included, because they may indicate the relevant influence of the social media contents. In all, 516 initial comments were collected between March 7, 2017, and March 7, 2019, which were classified separately by two raters (Cohan kappa value of 0.964). 312 neutral (non-MI) comments were excluded. The total number of MI comments was 204 (n=204). MI comments were found in FB posts created with or without MI strategies. The comments about the social media users' feelings, experiences and opinions about smoking cessation were written voluntarily and free from any external pressure. These comments did not involve personal data (e.g., personal number) or sensitive data (e.g., racial or ethnic origin).

## 3.4. Statistical analysis

We used the Statistical Package for the Social Sciences (SPSS) software for all analyses. A statistically significant effect was indicated by the p value of less than 0.05, and a highly significant effect was shown by the p value of less than 0.001. The following statistical tests were performed: Pearson's chi-square test, Welch's t-test, independent two-sample t-test, Kruskal–Wallis H test, one-way analysis of variance, Dunn's test adjusted with the Bonferroni correction, Tukey's honestly significant difference test, and Spearman correlation.

# 4. Results

## 4.1. Target population's habits, knowledge, and attitudes (1st research)

### *4.1.1. Sociodemographic data*

The mean age of the study population was 22.57 +/- 5.08 years (N=332). Regarding gender distribution, 61% of the participants were women and 39% were men. By place of residence, 18% of the study population lived in the capital, 19% in a county seat, 39% in a city, and 23% in a village. Regarding the highest level of education, 15% of the study population possessed a university or college degree, 58% had completed secondary education, 23% had completed primary school, and lastly 4% had other educational attainment or did not have any formal degree of education. With regard to their smoking history, 65% of the participants were smokers, 12% were former smokers, and 23% were non-smokers.

### *4.1.2. Changes in habits, knowledge, and attitudes*

Significantly more non-smokers who lived in villages reported some positive change in their attitudes towards smoking than non-smokers who lived in larger settlements ($p<0.05$). Among non-smokers, we found a similar significant correlation regarding educational attainment, whereby a lower level of education was associated with significantly more attitude changes ($p<0.05$). Furthermore, positive attitude changes were reported by significantly more younger non-smokers ($p<0.05$). We did not observe any other significant differences between demographic characteristics and the changes in habits, knowledge, and attitudes.

### *4.1.3. Smoking habits*

The smokers had been smoking for an average of 7 +/- 5 years, and 94% of them smoked daily ('regular smokers'), 6% of them smoked less than daily ('occasional smokers'). Regarding tobacco dependence, 55% of the smokers were nicotine dependent. However, 53% of the smokers had a more than 24-hour attempt to quit within one year, and 26% of them made such an attempt within more than a year. Finally, 21% of the smokers never tried to quit for more than 24 hours. Smokers who reported more new knowledge about smoking cessation started smoking significantly earlier ($p<0.05$). We did not find any other significant differences between smoking habits and the changes in habits, knowledge, and attitudes.

### *4.1.4. Motivational stages of smoking cessation*

The smokers who were planning to quit in the near future reported that quitting had become more important to them, their self-confidence about quitting had increased, and they had changed their smoking habits positively since following the FB page ($p<0.05$).

#### *4.1.5. Frequency and duration of exposure*

The smokers who visited the social media contents more frequently reported that quitting had become more important to them, their self-confidence about quitting had increased, and lastly, they had changed their smoking habits positively since following the FB page ($p<0.05$). Moreover, the smokers who had been following the social media contents longer reported that their self-confidence about quitting had increased and they had changed their smoking habits positively since following the FB page ($p<0.05$). Among ex-smokers or non-smokers, we found no significant differences between the frequency and duration of exposure and the changes in habits, knowledge, and attitudes.

### 4.2. Intervention contents and delivery (2nd and 3rd research)

#### *4.2.1. Contents based on motivational interviewing*

Firstly, all MI-based social media contents were compared with the control group to evaluate MI strategies in an online context (2nd research). Our analysis confirmed that MI-based social media contents were associated with a significantly higher engagement rate ($p<0.05$) and a significantly higher fan–total reach ratio ($p<0.001$). This result suggests that MI strategies can stimulate more interactions and seem to appeal more to the audience of the FB page than informative or entertaining techniques. Nevertheless, significantly more change talk ($p<0.001$), DARN and CAT comments ($p<0.05$) were observed in the social media contents where MI strategies were used. These results highlight that MI strategies may help smoking cessation at both the early and late motivational stages.

#### *4.2.2. Relational and technical strategies separately*

Secondly, the relationship between the control group and each MI strategy was analysed to assess the influence of MI strategies separately (2nd research). In the following, the primary outcomes will be in the focus of the analysis. ‘Relational MI’ strategies were associated with a higher engagement rate than the control group ($p<0.001$). This result shows that ‘relational MI’ strategies seem to stimulate interactions. Nevertheless, a significantly higher fan–total reach ratio was noticeable in the social media contents where ‘reflecting change talk’ strategies ($p<0.001$) and ‘affirming change talk’ ($p<0.05$) strategies were applied compared to the control group. These findings highlight that ‘reflecting change talk’ and ‘affirming change talk’ strategies seem to be popular among the audience of the FB page. Finally, no significant correlation was found in negative feedback between the social media content types. This result could suggest that the inhibition of interactions was at the same level in the social media contents where MI strategies or other techniques were applied.

In the next step, the secondary outcomes of the 2nd research were assessed. Significantly more change talk comments were elicited in the social media contents where ‘elaborating change talk’ strategies ($p<0.001$) and ‘affirming change talk’ strategies ($p<0.05$) were used, compared to the control group. These findings could suggest that ‘elaborating change talk’ and ‘affirming change talk’ strategies seem to be useful in FB-based smoking cessation interventions. Significantly more DARN utterances were elicited by ‘elaborating change talk’ strategies compared to ‘reflecting change talk' strategies ($p<0.05$). However, ‘elaborating change talk’ strategies were not significantly different from the control group in the number of DARN comments ($p=0.063$). Lastly, more CAT utterances were evoked by ‘affirming change talk’ strategies ($p<0.001$), compared to the control group. Due to the increased number of DARN utterances, ‘elaborating change talk’ strategies seem to be effective at the early stages of cessation. ‘Affirming change talk’ strategies could be useful at the late stages, based on the fact that they provoke more CAT comments. Surprisingly, ‘softening sustain talk’ strategies did not generate significant differences in primary or secondary outcomes.

#### *4.2.3. Interactions, engagement, and organic reach*

Finally, the results of the 3rd research are presented for the ‘separate FB post data’. We found highly significant negative correlations ($p<0.05$) between ‘like’ reaction and some negative emotional comments or reactions (‘wow’, ‘sad’ and ‘angry’). Moreover, significant positive correlations ($p<0.05$) were found between negative FB interactions and ‘sad’, ‘wow’ reactions. These correlations between the engagement indicators can be explained by activities against the FB-based intervention. In contrast to these results, many highly significant positive correlations support the concept of engagement; for example, positive correlations between ‘comments’ and ‘clicks’; or ‘comments’ and ‘haha’ reaction ($p<0.001$).

The correlations between organic reach and FB interactions were also interesting. Mostly positive correlations were found, except for correlations with ‘like’ and ‘share’ interactions. A highly significant negative correlation of the ‘like’ reaction with total reach, fan reach, non-fan reach ($p<0.001$) was the most surprising result, which can highlight the widespread misconception of ‘more FB likes reflect higher reach’. Additionally, the significant negative correlation between ‘shares’ and fan reach ($p<0.001$), or the significant positive correlation between ‘shares’ and non-fan reach ($p<0.001$) should also be noted. The opposite directions of these correlations can explain the non-significant difference between ‘share’ interaction and total organic reach ($p=0.057$). In summary, these results can highlight the impact of FB users’ interactions on algorithmic content ranking and the calculation of organic reach.

# 5. Discussion and conclusions

We assessed an online smoking cessation intervention, which was targeted at young people aged 14–35 and based on the MI approach. In the 1st research, our main aim was to evaluate the impact of this FB-based intervention on the followers' smoking habits, cessation knowledge, and attitude changes. In the 2nd research, our main aim was to assess the usefulness of the MI strategies in an online context. Lastly, the correlations between FB users' interactions, the reach and engagement of the intervention were analysed in our 3rd research. The key strengths of this work are the large size of the intervention content dataset and the long duration of the MI-based smoking cessation support program. Primary FB-based public health interventions could gain benefits from our results; however, further research should be done to investigate the use of the MI strategies in other online platforms.

**New findings**

- The smokers who visited the investigated FB page more frequently and for a longer term reported significantly more positive changes in habits, knowledge, and attitudes.
- The smokers who were more motivated in quitting reported significantly more positive changes in habits and attitudes since they had started following the FB page.
- The social media contents which used MI strategies achieved a significantly higher engagement rate, fan–total reach ratio, and elicited significantly more change talk, DARN and CAT utterances compared to the control group.
- 'Elaborating change talk' strategies evoked significantly more change talk and DARN utterances, while 'affirming change talk' strategies generated significantly more change talk and CAT utterances.
- 'Relational MI' strategies achieved significantly higher engagement rate, while 'affirming change talk' strategies and 'reflecting change talk' strategies gained a significantly higher fan–total reach ratio.
- Negative FB interactions, negative emotional comments, and reactions ('wow', 'sad', 'angry') would reduce the engagement of FB smoking cessation interventions.
- Some reactions ('like', 'love', 'haha'), shares, positive comments, and clicks would raise the engagement of FB smoking cessation interventions.
- 'Like' reaction would decrease the total organic reach, while 'share' interaction would increase the non-fan reach, and decrease the fan reach of smoking cessation support contents on a public FB page.

According to the demographic data, the investigated FB page successfully addressed 14–35-year-old smokers, who accounted for two-thirds of the participants. Overall, around 50% of the smokers reported a positive change in smoking habits, cessation knowledge and attitudes. Our findings seem to support this conception, because smokers who visited FB page's contents more often and for a longer period reported significantly more positive changes in their smoking habits and smoking cessation attitudes.

Regarding our findings, we found that using the MI approach in FB post creation seems to stimulate interactions with young smokers and generate change talk about smoking cessation. We recommend ‘elaborating change talk’ and ‘affirming change talk’ strategies to create smoking cessation support FB posts or other public health contents. 'Relational MI' strategies should be used to expand the target audience. Furthermore, ‘affirming change talk’ and ‘reflecting change talk’ strategies can be advantageous in long lasting interventions which need a high retention rate. Overall, we recommend implementing the MI approach in online health behaviour change and smoking cessation interventions. ‘Elaborating change talk’, ‘affirming change talk’ and 'relational MI' strategies could be beneficial in extended web-based interventions, such as websites, blogs, or social media pages.

The correlational analysis of FB interactions can shine new light on the engagement of FB-based smoking cessation interventions. A novel classification of the engagement indicators should be considered. Negative FB interactions; negative emotional comments; 'wow', 'sad', and 'angry' reactions may decrease the engagement, while 'like', 'love', 'haha' reactions, shares, positive comments, and clicks may increase the engagement of these interventions. Based on our findings, we suggest implementing the continuous evaluation of FB interactions during smoking cessation interventions.

Lastly, the correlations between FB users’ interactions and organic reach may be also informative for the design of FB-based interventions. This is the first study to report a disadvantage of 'like' reaction and highlight the advantages of other interactions in algorithmic content ranking on FB. Moreover, our results suggest the need for further categorization of fan-specific and non-fan-specific FB interactions. The generalizability of these results is wide, because these correlations depend only on the algorithmic content ranking, which does not contain demographic data, smoking status, or other health risks. We tried to explore the relationship between the algorithmic content ranking and FB users' interactions, nevertheless, further research is needed.

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