

# eHealth Intervention for Smoking Cessation for Czech Tobacco Smokers: Pilot Study of User Acceptance

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**BACKGROUND:** The development of information and communication technologies is bringing new therapeutic options, including behavioural changes in the area of health promotion. The eHealth interventions also offer new options in efforts to stop smoking. **AIM:** A pilot study aimed at the assessment of the functionality aspects and user acceptance of an eHealth application for quitting smoking. **METHODS:** The study used a mixed-methods design and was conducted from July 2016 to February 2017. We recruited 34 tobacco users (solely cigarette smokers). Thirty respondents tested the eHealth application on their own mobile devices for a predefined period of time (up to one month). Quantitative data was collected with a data management system of the eHealth program. User acceptance was surveyed through structured telephone interviews. Feedback from the users was collected via qualitative focus groups. Quantitative

analysis was performed using descriptive statistics; qualitative data was analysed with the cluster analysis method. **RESULTS:** The respondents completed 10 days of the pre-quitting phase on average and three weeks of the quitting phase, with a total of 19 delivered and completed online sessions. Overall, the therapeutic aspects of the eHealth intervention were seen as positive. Nearly 75% of all the actively participating respondents (n=30) preferred the eHealth intervention to seeking other professional services during the quitting phase. The study confirmed the acceptance of the new treatment modality from the point of view of the target group of tobacco smokers, despite some technical issues accompanying the pilot launch of the intervention. The eHealth application that was evaluated constitutes a promising and innovative direction in addiction treatment.

**Keywords** | eHEALTH – Tobacco – Smoking – Smartphone – Online intervention – Dependence

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## ● 1 INTRODUCTION

Tobacco smoking is among the most serious public health issues contributing to increased morbidity and mortality (WHO, 2017). The rapid development of information and communication technologies is introducing new options and applications in addiction treatment practice (Kulhánek, 2017). Smartphones and internet connectivity are becoming increasingly globally accessible, which enables therapeutic practitioners to deliver interventions focused on a change of lifestyle to a high number of end users (Webb, Joseph, Yardley, & Michie, 2010). Unlike face-to-face guidance, online interventions overcome the barriers of time and location, and they can be used in real time (Shiffman, Stone, & Hufford, 2008). A significant advantage of web-based and mobile-based programs is that they can be adapted to individual users on the basis of the diagnosis, age, sex, and other characteristics (Etter, 2006; Oliver et al., 2017).

Several studies suggest that patients perceive eHealth solutions to be acceptable to use (Blitchtein-Winicki et al., 2017; Currie, Philip, & Roberts, 2015; Duplaga, 2013; Wentink, Prieto, de Kloet, Vliet Vlieland, & Meesters, 2017). Systematic reviews testify to the efficacy of personalised online smoking cessation interventions (Civljak, Stead, Hartmann-Boyce, Sheikh, & Car, 2013; Graham et al., 2016; Whittaker, McRobbie, Bullen, Rodgers, & Gu, 2016). For example, in one randomised trial of such a smoking cessation intervention (“Happy Ending”), Brendryen, Drozd, and Kraft (2008) reported that receiving the eHealth intervention tripled the odds of quitting compared to receiving a self-help booklet (20% versus 7% repeated point abstinence; odds ratio = 3.43, 95% CI = 1.60-7.34, N = 290, P = .002). On the basis of the experience with Happy Ending (Brendryen, Kraft, & Schaalma, 2010), and other comprehensive eHealth interventions that provide extensive follow-up (Brendryen, Johansen, Nesvag, Kok, & Duckert, 2013; Drozd, Haga, Brendryen, & Slinning, 2015) a more flexible second-generation intervention named “Endre” was developed. Endre is a fully automated program providing extensive therapeutic support to smokers in the process of quitting smoking (Holter, Johansen, & Brendryen, 2016).

Despite the high prevalence of tobacco smoking (Váňová, Skývová, & Csémy, 2017) and the high internet and smartphone penetration in the Czech population (Czech Statistical Office, 2017), systematic research on eHealth approaches to addiction treatment has not yet been fully adopted in the Czech Republic. Except for a few commercial applications, of which the effectiveness has never been evaluated, Czech smokers have no opportunity to use state-of-the-art online support for their efforts to quit in their mobile devices. The response to this drawback consisted of adapting the Endre eHealth intervention to the Czech environment. The content of the eHealth intervention has been translated, localised, and customised to the Czech environment (i.e. text translation including idiomatic expressions, adaptation of the therapeutic language, graphic modification, etc.) to support adherence and the therapeutic relationship among Czech tobacco smokers. The aim of the current study was

to assess the feasibility and user acceptance of an eHealth application for quitting smoking among Czech smokers.

## ● 2 METHODS

The pilot study used a mixed-methods design and was conducted in 2016 and 2017.

### 2.1 Participants and Recruitment

Smokers were recruited through digital advertising (social networks and selected websites focused on quitting smoking and tobacco dependence-related topics). The inclusion criteria for participation in the study were: an age of 18 years and older, current use of tobacco products (including combustible and smokeless tobacco and e-cigarettes), and having their own smartphone with an everyday internet connection and an active SIM card. A total of 34 persons (solely cigarette smokers) volunteered to participate (16 women, average age 34 years, the youngest aged 21, the oldest aged 53). Regarding occupational status, the majority of the respondents were employed (n = 20), but the sample also included five self-employed people, five students, three unemployed people, and one retired person.

### 2.2 Intervention

The basic idea of the intervention is to simulate a series of counselling sessions about quitting smoking based on the motivational interviewing approach. In a separate paper, Holter, Johansen, and Brendryen (2016) describe how “a counselor’s support of a working alliance, internal motivation, and lapse preparation and management are simulated in Endre”. These therapeutic processes are simulated using individually tailored web sessions consisting of multiple brief web pages, where each text is written in such a way as to be similar to how a counsellor would address a client. For example, the program refers to itself using the personal pronoun “I”, addresses the user by his/her first name, asks questions and reflects answers empathically, uses greetings and farewells, uses humour, and refers to previous interaction to demonstrate that “I” remember what “we” talked about. Throughout each session, the client provides multiple inputs in the form of multiple-choice answers or free text. Moreover, all users are offered the same set of sessions, but the path through each session will differ as it is based on previous and current user input. Thus, Endre can be considered a non-embodied conversational agent similar to a chatbot.

In addition to web pages, the intervention also uses emails and text messages to communicate with the user. The web pages are designed with the small screens of smartphones or tablets in mind, but can also be accessed on computers. The user interface of the eHealth application is simple, intuitive, and user-friendly. The programme is divided into two basic phases: the preparation phase that leads up to the quit

date, and the follow-up phase that comes after the quit date. The standard length of the intervention phase is six weeks, but this can vary on the basis of the responses of individual users, the fulfilment of the individual quitting plan, motivation, and recorded relapses. An important feature is the lapse management system, an intrinsic part of the quitting phase. The purpose of the lapse management system is help users to manage a lapse constructively and to avoid a full-blown relapse. Each evening during the follow-up phase the user receives a text message asking whether he/she has been smoke-free that day. If the user replies “no”, he/she will receive another text message that refers him/her to a web-based therapy session aimed at influencing how he/she thinks and feels about the lapse and to take the decision to continue the attempt to quit (instead of starting to smoke again). For more details on the content and rationale of the intervention, see Holter, Johansen, and Brendryen (2016).

### 2.3 Data collection

We collected sociodemographic data (sex, age, education, occupational status, etc.). Input data from users (type of electronic device, operating system, the time and frequency of each log-in, the number of completed sessions, the duration of the pre-quitting and quitting phases, and the number of text messages received/sent) was collected automatically by a data management system as part of the eHealth program. The Fagerström Test for Nicotine Dependence (FTND) was used to determine users’ nicotine dependence (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991).

Structured telephone interviews (at least two with each respondent, a total of 60) were used to monitor user acceptance of the application. The aim was to determine the user-friendliness of the application and the evaluation of the therapeutic relationship on a five-point scale, as well as the type of therapy preferred. Qualitative feedback was collected within two focus groups with selected respondents (five respondents per focus group, each respondent remunerated with ~20 Euros). The authors inquired about specific user experience gained with the application, situational variables, the level of adherence, suggestions for improvement, etc.

All the respondents in the pilot study were assigned unique, fully anonymous codes; they were also informed about the conditions governing their participation in the programme, and they signed informed consents. All the input data was stored on a secure server and archived on password-protected backup storage media. The contact data of the respondents (email address and telephone number) was stored separately and with no possibility of being matched with specific respondents in order to increase security further. The study was approved by the Ethics Commission of the Government Council for Drug Policy Coordination.

### 2.4 Data analysis

The numeric data was evaluated with descriptive statistics. The qualitative data was sorted and analysed using qualitative cluster analysis (Miovský, 2006).

## 3 RESULTS

A total of 34 persons volunteered to participate. Two persons never started testing the eHealth intervention, and another two persons stopped using the intervention before they could provide any data. The final sample consisted of 30 respondents. The FTND test determined at least medium (5 points) and higher (6–7 points) nicotine dependence in all the respondents. Two-thirds of the respondents reported a higher degree of nicotine dependence.

The pre-quitting phase lasted 10 days on average. The quitting phase lasted three weeks. Each respondent received and completed an average of 19 online sessions altogether. All of the 30 respondents finished the entire pre-quitting phase. However, they only finished less than a half of the standard one-month quitting phase.

In *Table 1*, we present a list of the most frequently reported benefits according to the respondents’ answers.

Technological Aspects	Therapeutic Aspects	Other
Simple control	Continuous everyday support	Flexibility of intervention time
Intuitive user interface	Respect-based and partnership-based approach	Availability in one’s own device
Attractive form	Authentic dialogue simulation	
	Support and appreciation	
	Strengthening motivation	

**Table 1** | The most frequently reported benefits of the eHealth intervention for smoking cessation from the perspective of respondents (n=30)

Three-quarters of the sample would prefer to quit with the support of the eHealth application that was tested rather than seeking a conservative professional service (a physician, addiction specialist, pharmacist, or other professional). If the eHealth intervention were commercially available, nearly 60% of the respondents would seriously consider a purchase, and nearly half of them would use it for their next attempt to quit smoking. No significant correlation between the user acceptance rate and socio-demographic status was found. As this pilot study was the first test of the Czech version of the eHealth intervention, quite a few technical difficulties and program errors were encountered (i.e. occasional system downtimes, limited functionality of the text messaging system, and several other problems). The majority of the negative feedback

from the users was related to these technical difficulties. Other recommendations made by the respondents were improving the language of the textual content and updating the graphic content of the intervention.

Eight respondents reported being abstinent for seven days or longer following the end of the intervention; six respondents reported a reduction in the number of cigarettes smoked per day.

## ● 4 DISCUSSION

Despite the technical difficulties, negative feedback on the language, and treatment dropout, the study demonstrates a fairly high level of user acceptance of this new treatment modality. The prevalence of positive feedback regarding the therapeutic functionalities of the intervention confirmed our presumption that the eHealth intervention is capable of strengthening user adherence and compliance.

Although the evaluation of the efficiency of the eHealth intervention was not among the objectives of the pilot study, telephone interviews determined that eight respondents confirmed continuing abstinence of seven days and longer following the end of the programme, and six respondents confirmed that they were smoking a reduced number of cigarettes per day, despite the technical issues accompanying the program.

The pilot study proved the basic technological functionalities of the eHealth intervention, as well as positive acceptance of this new treatment modality from the view of real end users. The therapeutic functionalities (i.e. personalised content, the simulation of a therapeutic relationship, increasing motivation, and strengthening self-efficacy), combined with the benefits of online technology (availability, flexibility in time, real-time operation), are viewed by users as being the key treatment factors for any fully automated program. These findings are in accordance with the experiences of Norwegian research studies (Brendryen & Kraft, 2008; Holter et al., 2016). The launch of a fully-fledged eHealth intervention placed heavy demands on a multidisciplinary team of experts on IT, clinical addiction specialists, and eHealth professionals. The provision of continuous financial support and evaluation in the form of an effectiveness study are basic requirements for the practical implementation of this innovative treatment option. Two respondents out of the total of 34 persons did not possess devices fulfilling the minimum technical requirements and/or internet connection requirements, and thus never started testing the application. These technological limits are

among the real-world obstacles that prevent eHealth interventions from greater expansion in addiction treatment. Despite the increasing availability of modern technologies, some population groups may need to overcome other obstacles (Oliver et al., 2017), such as insufficient digital literacy, limited coverage of mobile data networks, paying for an application fee, and/or the strictly limited data plans offered by mobile providers. These factors need to be considered in the planning and implementation of eHealth technologies. Two persons quit the programme within the course of testing, following disrupted program continuity caused by technical issues with the implementing party.

This study had many limitations, such as the instability of the eHealth intervention, stylistic and language flaws, the limited testing period of the eHealth intervention resulting from limited funding, and the fact that the data was not complete for some of the respondents. This study also had strengths, i.e. the mixed-methods design used, the various groups of participants recruited on the basis of socio-economic criteria, and international research collaboration.

The eHealth application for the prevention of relapse in tobacco users that was evaluated constitutes a promising and innovative direction in addiction treatment.

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**Authors' contribution:** The study protocol was designed by AK and RG. The data analyses were conducted and the manuscript was drafted by AK. The literature review and summary of related work were conducted by AK and RG. DN, VB and HB contributed to the writing of additional sections of the

manuscript. The final version of the manuscript was contributed to and approved by all the authors.

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