Efficacy of a single computer-tailored e-mail for smoking cessation: results after 6 months

Fam Te Poel¹,², Catherine Bolman¹,³, Astrid Reubsaet¹,² and Hein de Vries¹,²*

Abstract

To date, few Internet-delivered smoking cessation interventions have been tested. This study tested the efficacy, understandability, credibility and personal relevance of an e-mail-delivered computer-tailored smoking cessation intervention. It included tailored action plan feedback, as recent studies have demonstrated the importance of planning in facilitating quitting smoking. Participants (Dutch adults) were randomly assigned to the intervention (computer-tailored e-mail; N = 224) or the control group (generic, non-tailored e-mail; N = 234). The results 6 months after baseline (N = 195) showed that significantly more participants in the intervention group reported not having smoked in the last 24 hours (21.5%) and 7 days (20.4%) in contrast with participants in the control group (9.8 and 7.8%, respectively). Intention-to-treat analyses revealed similar results, though overall lower quitting percentages. Furthermore, participants in the intervention group appreciated the computer-tailored e-mail significantly more in terms of understandability, credibility and personal relevance. Hence, the computer-tailored intervention is effective for the Dutch smoking population motivated to quit smoking. Further research is needed into the efficacy of the intervention for smokers who are not motivated to quit smoking and into the benefits of (multiple) e-mail-delivered tailored letters with tailored action plan feedback over and above tailoring without action plan feedback.

Introduction

In 2007, 27.5% of the Dutch population smoked. Of these smokers, 37% intended to quit within a year or sooner [1]. The computer-tailored smoking cessation intervention is a potential line of help for smokers intending to quit. Computer tailoring is a relatively new but promising method (for an overview see [2–6]) as it aims to increase the relevance and attractiveness of smoking cessation support, and thus, leads to more and deeper processing of information [2, 7, 8]. Most computer-tailored interventions belonging to first-generation computer tailoring used paper and pencil to gather personal data and sent tailored feedback by post [9, 10]. New second-generation programs, however, use the Internet to gather data and deliver the tailored feedback [11]. In 2006, 80% of all households in The Netherlands and 85% of Dutch people of 12 and over had access to the Internet [12]; this makes the Internet an important and influential medium for smoking cessation interventions as well [10, 13–29]. Oenema et al. [30, 31] demonstrated the efficacy of a Dutch web-delivered computer-tailored intervention in the field of nutrition education, but only a few studies have tested the efficacy of web-delivered computer-tailored smoking cessation...
interventions. Etter [32] and Strecher et al. [19] found web-delivered tailored smoking cessation interventions in combination with nicotine replacement therapy to have positive effects compared with web-delivered generic interventions. Cobb et al. [33] revealed that sustained use of a smoking cessation website with tailored content had positive effects on abstinence rates but used no comparison group. Lenert et al. [34] revealed short-term beneficial effects of a web-based intervention that included individually timed e-mail messages compared with a single-point-in-time web-based intervention.

In The Netherlands, a first-generation paper-and-pencil computer-tailored smoking cessation intervention was implemented nationwide. That intervention had positive effects on smoking cessation when compared with no information, for smokers with varying readiness to quit [35, 36]. The discussed intervention had no positive effect on smoking cessation in comparison with a similar, but non-tailored, intervention for smokers who were not at all or very poorly motivated to quit smoking [37]. That intervention is currently offered to the Dutch general public in an e-mail-delivered format. Evidence is not available with regard to the effectiveness of that e-mail-delivered intervention in comparison with a similar but non-tailored intervention for smokers who are moderately to highly motivated to quit smoking (intending to quit within 1 year). We developed a revised e-mail-delivered version, to which we added explicit goal-setting techniques, referred to as action planning, as recent studies demonstrate the importance of planning in facilitating quitting [38, 39]. Action planning helps translate intentions into behavior [38–41]. It is based on goal-setting theory [42–44], which states that specific task strategies—action plans—are needed in order to realize a certain behavior. For smoking cessation, they can involve activities such as removing ashtrays from the house. These deliberate strategies can influence behavior in the right direction and be either self-developed or learned, e.g. by provision of tailored action plan feedback.

We hypothesized that an e-mail-delivered computer-tailored smoking cessation intervention with tailored action plan feedback would lead to higher quit rates after 6 months than a generic, e-mail-delivered, non-tailored smoking cessation intervention with non-tailored action plan information. Second, we hypothesized, in line with findings by De Vries et al. [45], that the tailored intervention would be evaluated more positively in terms of readability, understandability and credibility.

Methods

Ethical approval for this study was obtained from the Medical Ethics Committee of the Academic Hospital Maastricht and Maastricht University.

Participant recruitment

Smokers were recruited by advertisements in local newspapers, banners on websites, distribution of flyers and posters and via a random selection of smokers’ e-mail addresses purchased from a customer information management company. Smokers were asked to volunteer for a study on a new, computer-tailored, e-mail-delivered smoking cessation intervention. They were informed that they had a 50% chance of enrolling in the control group and would then receive non-tailored e-mail-delivered smoking cessation information. Furthermore, they were informed that they might be invited for cotinine validation. Participants were offered €7.50 to fill out all questionnaires; they also had to register and download an informed consent form on the project’s website. After registration, they received a login code and were asked to fill out the online baseline questionnaire (T0). In total, 615 participants registered, of whom 458 (86.2%) were eligible (see design and procedure for inclusion criteria) and completed the baseline questionnaire (Fig. 1).

Design and procedure

The computer program used for generating the generic and tailored interventions randomly assigned smokers either to the control group (non-tailored feedback) or to the intervention group (tailored feedback). Participants were not aware of the group (control or intervention) to which they were assigned. The questionnaire at T0 started with a check for eligibility (18 years or older, smoker
of cigarettes and/or loose-cut tobacco and intending to quit within a year or sooner). Participants who did not fulfill the enrollment criteria received a computerized message explaining why they could not participate. All other participants continued to complete the questionnaire. Next, participants from the intervention group \((N = 224)\) received a tailored feedback letter by e-mail immediately upon completing the questionnaire; respondents from the control group \((N = 234)\) received a generic, non-tailored letter via e-mail within the same period. Six months \((T1)\) after filling out the baseline questionnaire, the participants \((N = 458)\) were again contacted by e-mail and requested to fill out the second questionnaire. In cases of no response, two reminders were sent by e-mail within 3 weeks of the first request.

**Measurements**

**Baseline**

Demographics assessed were sex, age and education level (low, medium or high). Level of depression was measured by 10 items \((\alpha = 0.86)\) \[46\]. Occurrence of chronic respiratory disease, cardiovascular disease, cancer or diabetes was measured by one dichotomous item each (‘Do you suffer from … ?’; 0 = no, 1 = yes; index: 0 = no disease to 4 = occurrence of four diseases). Behavioral factors measured were occurrence of a previous quit attempt and number of tobacco products per day. Level of addiction was measured by six items (index: minimum score = 0, maximum score = 10; \(\alpha = 0.70\)) \[47\].

Attitude was assessed by means of the pros of quitting (11 statements on four-point scale, \(\alpha = 0.85\)) and the cons of quitting (nine statements on four-point scale, \(\alpha = 0.60\)). Social modeling was measured by two statements regarding the smoking behavior of residential children and partner (1 = smoking, 0 = not applicable, \(-1 =\) not smoking). Self-efficacy was measured by 16 questions, asking participants to indicate whether they would be able to refrain from smoking in social, habitual and emotional situations and when confronted with the negative outcomes of quitting (five-point scale, \(\alpha = 0.90\)). In addition, one item measured whether
one would be able to refrain from smoking after a lapse after 1 week, using the same answer categories. Readiness to quit smoking was measured on a four-point scale asking participants whether they intended to quit smoking within 1 (3 = preparers), 3 (2 = contemplators/preparers), 6 (1 = contemplators) or 12 months (0 = precontemplators) [48]. Action plans (Appendix A) were measured by 17 items on a five-point scale (α = 0.73) [38, 45, 49; F. te Poel, C. Bolman, A. Reubsaet and H. de Vries, submitted for publication].

Follow-up
The main outcome measures at 6 months (T1) post-test were 24-hour and 7-day point prevalence abstinence (0 = yes, smoked during past 24 hours/7 days, 1 = no, did not smoke during past 24 hours/7 days; [50]). We also asked whether participants had read the e-mail letter (1 = completely read the e-mail, 2 = did not read the e-mail, 3 = do not remember reading the e-mail). Participants’ evaluation in terms of the e-mail’s personal relevance, understandability and credibility was measured by 12 questions measured on a five-point scale (1 = completely disagree, 5 = completely agree; α = 0.62) [45] and by asking participants to rate the e-mail overall (1 = very bad, 10 = very good).

Intervention
The intervention comprised a seven-to-nine page computer-tailored e-mail letter. The control group received a generic, non-tailored e-mail letter (seven pages). The tailored intervention e-mail was based on a previously developed computer-tailored smoking cessation intervention [35, 36]. In the development process of that intervention, smokers and health educators were consulted [51]. The intervention e-mail as well as the e-mail for the control group was based on the I-Change Model [42, 52, 53]. This model for motivational and behavioral change distinguishes between determinants in three phases of motivational change, namely the pre-motivational (knowledge, risk perceptions, cues to action), motivational (attitudes, social influences, self-efficacy) and post-motivational phase (skills, action planning).

Feedback in the e-mails was aimed at the motivational and post-motivational determinants. The essential difference between the two e-mails (intervention and control) is that respondents in the intervention group received feedback that was based on the responses to the questions about these determinants, whereas the respondents in the control group received generic non-tailored information about these determinants.

Intervention e-mail
In the e-mail heading, the respondent was addressed by name and sex (i.e. Mr/Ms). Next, the e-mail addressed individuals’ perceptions of the pros of quitting (e.g. decreased likelihood of lung cancer) in order to increase the advantages of quitting by reinforcing existing beliefs and providing new information on these advantages. Feedback addressing the disadvantages of quitting was provided in the same vein and referred, for instance, to withdrawal symptoms in order to invalidate existing negative beliefs. With respect to social modeling, feedback addressed how to deal with the presence of smoking children and/or a smoking partner (e.g. asking smoking partner not to smoke when participant was around to avoid temptation). Self-efficacy-enhancing feedback dealt with how to gain confidence to quit in various social, emotional and habitual situations that the participant perceived as difficult and when confronted with negative consequences of quitting. Tailored feedback on action planning was offered with regard to the beneficial effects of planning and of using certain strategies in the process of quitting, such as planning a quit date or using smoking cessation aids. Finally, a personalized overview that set out the action plans the participant intended to implement was provided at the end of the e-mail. Space was also provided in which participants could formulate the personal action plans that they might have decided to implement after reading the tailored feedback. We linked the answers of the separate baseline questions to pre-existing messages by using over 650 algorithms in a computer database. Feedback was provided on item level, for example, separately for each advantage (e.g. [19]). Participants in the
intervention group therefore all received a different e-mail letter with regard to content.

Control e-mail
The control group received information that was similar in content to the information described in the intervention e-mail. Although addressing the same themes and using the same delivery mode, this e-mail, however, was not tailored (i.e. not generated from algorithms) to personal, item-level motivational factors, amount of planning, demographics or biological factors (e.g. ‘Quitting is something that you have to do on your own, but the use of particular aids might help you …’) instead of ‘You indicate that you do not want to use any smoking cessation aids in the process of quitting. Quitting is something that you have to do on your own, but the use of particular aids might help you …’). Furthermore, no personalized action plan overview was provided at the end of the e-mail. The control e-mail therefore was not built upon the key elements of tailoring, namely personalization, adaptation and feedback [7] and all participants thus received the same e-mail letter with regard to content. The intervention e-mail was in some cases longer than the control e-mail because the information was tailored, needed more subheadings and included an overview of the action plans and therefore needed more elaboration.

Analyses
Logistic regression analyses with baseline characteristics and group were conducted to determine whether randomization was successful and whether loss to follow-up was selective.

To test the effects of tailoring, logistic regression analyses were used with 24-hour point prevalence and 7-day point prevalence abstinence rates as dependent variables and group as the independent variable, in the first block. All baseline variables as described in the measurement section were considered as covariates in the second block, in order to increase statistical power by reducing unexplained variance [54]. Analyses were repeated with an intention-to-treat procedure, in which participants lost to follow-up were considered smokers.

Multivariate analysis was conducted to analyze whether group predicted the combination of the 13 process measures regarding evaluation of the intervention. Only participants who read the e-mail letter were included in this analysis. Data were analyzed with SPSS version 15.0.

Results

Participant characteristics: randomization and attrition check
The mean age at baseline of the 458 participants was 46.1 years (SD = 10.9); 56.1% were female. In total, 15.7% of participants had no or little vocational training (low), 48.7% had advanced vocational training (medium), 31.7% had college/university training (high) and 3.9% of participants did not report their education level.

Occurrence of a smoking-related disease, baseline smoking characteristics and baseline mean scores of the cognitive measures are presented in Table I. Participants in the intervention group smoked on average significantly more tobacco products per day at baseline (Mean = 22.0) compared with those in the control group (Mean = 20.0; \( P = 0.03 \)). The analyses revealed no further differences between the control group and intervention group regarding baseline characteristics (all \( P > 0.16 \)).

Of the 458 participants at baseline, 195 (42.6%) filled in the second questionnaire (T1, 6 months after baseline; see Fig. 1). In the control group, 56.4% of participants were lost to follow-up versus 58.5% in the intervention group. No differences in dropout were revealed (all \( P > 0.22 \)).

Effects on smoking cessation 6 months after baseline
Table II shows the effects of the program. In comparison with the control group, participants in the intervention group reported significantly more 24-hour (9.8 versus 21.5%, \( P = 0.02 \)) and 7-day (7.8 versus 20.4%, \( P = 0.01 \)) point prevalence abstinence after 6 months (\( N = 195 \)). Intention-to-treat analyses (\( N = 458 \); Table II) revealed similar results, with minor changes in odds ratios (ORs) and \( P \)-values;
quit rates dropped. In comparison with the control group, participants in the intervention group reported significantly more 24-hour (4.3 versus 8.9%, \( P = 0.01 \)) and 7-day (3.4 versus 8.5%, \( P = 0.01 \)) point prevalence abstinence. Action planning at baseline (T0) did not predict abstinence rates (all \( P > 0.50 \) with and without intention-to-treat analyses).

**Program evaluation**

In 10 of the 13 evaluation measures, participants in the intervention group evaluated the intervention e-mail significantly better than participants in the control group (Table III). Participants in the intervention group regarded the tailored e-mail as more interesting, containing new information, being personally relevant and capturing their own opinion, and as trustworthy. Furthermore, participants who received the generic, non-tailored e-mail had significantly higher scores on the evaluation items ‘The letter was annoying’, ‘The tone of the letter was irritating’ and ‘The latter nagged about quitting smoking’. Finally, participants in the intervention group evaluated the tailored letter significantly higher overall (\( Mean = 7.1, SD = 1.5 \)) compared with participants in the control group regarding the non-tailored letter (\( Mean = 6.5, SD = 1.9 \)).

**Discussion**

This study assessed the effects of a computer-tailored smoking cessation e-mail intervention compared with a generic non-tailored e-mail on smoking cessation. In comparison with the control group, participants in the intervention group reported significantly more 24-hour and 7-day point prevalence abstinence. Action planning at baseline (T0) did not predict abstinence rates (all \( P > 0.50 \) with and without intention-to-treat analyses). The program evaluation revealed that participants in the intervention group evaluated the tailored e-mail significantly better than the control group in 10 of the 13 evaluation measures. Participants in the intervention group regarded the tailored e-mail as more interesting, containing new information, being personally relevant and capturing their own opinion, and as trustworthy. Furthermore, participants who received the generic, non-tailored e-mail had significantly higher scores on the evaluation items ‘The letter was annoying’, ‘The tone of the letter was irritating’ and ‘The latter nagged about quitting smoking’. Finally, participants in the intervention group evaluated the tailored letter significantly higher overall (\( Mean = 7.1, SD = 1.5 \)) compared with participants in the control group regarding the non-tailored letter (\( Mean = 6.5, SD = 1.9 \)).
cessation after 6 months. Significantly more participants in the intervention group reported not having smoked for the last 24 hours (21.5%) and the last 7 days (20.4%) compared with participants in the control group (9.8 and 7.8%, respectively). These results imply that the proposed intervention was more effective in promoting smoking cessation than a generic non-tailored e-mail for smokers who were moderately to highly motivated to quit smoking. Other smoking cessation studies, although not fully comparable with regard to condition, outcome measures or follow-up time frames, revealed similar results. Etter [32], for example, showed a 7-day point prevalence abstinence rate of 14.6% after 2.5 months (intention to treat), after exposure to a smoking cessation website. Borland et al. [55], although using a series of tailored advice letters, also reported a beneficial effect of computer-tailored feedback over and above non-tailored printed self-help cessation materials. Swartz et al. [20] reported similar 7-day point prevalence abstinence rates to ours at 90 days’ follow-up, in an effectiveness study of a web-based smoking cessation program (24.1% with and 12.3% without intention-to-treat analyses). McKay et al. [23], in

### Table II. Logistic regression analyses of the outcome variables '24-hour point prevalence abstinence' and '7-day point prevalence abstinence' 6 months (T1) after baseline (T0) on difference between intervention (I) and control (C) group

<table>
<thead>
<tr>
<th>Group</th>
<th>Complete case</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Intention to treat</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C (N = 102)</td>
<td>I (N = 93)</td>
<td>OR</td>
<td>95% CI</td>
<td>P-value</td>
<td>C (N = 234)</td>
<td>I (N = 224)</td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>24-hour point</td>
<td>9.8%</td>
<td>21.5%</td>
<td>3.00</td>
<td>1.17</td>
<td>7.68</td>
<td>4.3%</td>
<td>8.9%</td>
<td>2.68</td>
<td>1.17</td>
</tr>
<tr>
<td>prevalence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-day point</td>
<td>7.8%</td>
<td>20.4%</td>
<td>4.04</td>
<td>1.40</td>
<td>11.64</td>
<td>3.4%</td>
<td>8.5%</td>
<td>3.33</td>
<td>1.34</td>
</tr>
<tr>
<td>prevalence</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*Analyses were adjusted for age, sex, education level, level of depression, occurrence of a smoking-related disease, previous quit attempt, number of tobacco products per day, level of addiction, pros, cons, social influence children, social influence partner, self-efficacy, stage of change and action planning.

*bControl group = 0; intervention group = 1.

### Table III. Multivariate analysis with process evaluation items (T1) as dependent variables and group as independent variable

<table>
<thead>
<tr>
<th></th>
<th>Control group (N = 92)a</th>
<th>Intervention group (N = 83)a</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I remember the content of the</td>
<td>3.4 (1.0)</td>
<td>3.7 (0.9)</td>
<td>0.06</td>
</tr>
<tr>
<td>letter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The letter was interesting</td>
<td>3.5 (0.9)</td>
<td>3.8 (0.8)</td>
<td>0.02</td>
</tr>
<tr>
<td>The letter contained new</td>
<td>2.7 (1.0)</td>
<td>3.2 (0.9)</td>
<td>0.00</td>
</tr>
<tr>
<td>information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The content was personally</td>
<td>3.0 (0.9)</td>
<td>3.6 (0.8)</td>
<td>0.00</td>
</tr>
<tr>
<td>relevant to me</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The letter was understandable</td>
<td>4.1 (0.6)</td>
<td>4.2 (0.6)</td>
<td>0.10</td>
</tr>
<tr>
<td>The letter reflected my own</td>
<td>3.3 (0.9)</td>
<td>3.6 (0.8)</td>
<td>0.02</td>
</tr>
<tr>
<td>opinion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The letter was related to my</td>
<td>3.4 (0.8)</td>
<td>3.7 (0.8)</td>
<td>0.03</td>
</tr>
<tr>
<td>own situation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The content of the letter</td>
<td>3.8 (0.7)</td>
<td>4.0 (0.6)</td>
<td>0.06</td>
</tr>
<tr>
<td>was credible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The content of the letter</td>
<td>3.8 (0.7)</td>
<td>4.0 (0.6)</td>
<td>0.01</td>
</tr>
<tr>
<td>was trustworthy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The letter was annoying</td>
<td>2.2 (1.0)</td>
<td>1.8 (0.7)</td>
<td>0.00</td>
</tr>
<tr>
<td>The tone of the letter was</td>
<td>2.2 (1.0)</td>
<td>1.8 (0.7)</td>
<td>0.00</td>
</tr>
<tr>
<td>irritating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The letter nagged about quitting smoking</td>
<td>2.3 (0.9)</td>
<td>2.1 (0.9)</td>
<td>0.01</td>
</tr>
<tr>
<td>Overall evaluation of the</td>
<td>6.5 (1.7)</td>
<td>7.1 (1.2)</td>
<td>0.01</td>
</tr>
<tr>
<td>letter</td>
<td></td>
<td></td>
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</tbody>
</table>

Means and SDs of the process evaluation items (T1).

*aDue to missing values (n = 8) and exclusion of participants who did not read the e-mail letter (n = 3) or did not remember reading the e-mail letter (n = 11), total N = 187.
a study examining the effects of two web-based smoking cessation programs, revealed point prevalence abstinence rates of approximately 25% without intention-to-treat analyses and 10% with intention-to-treat analyses, at the 6-month follow-up.

Additionally, and in line with other studies [19, 45], we found that participants receiving tailored feedback compared with those who received a generic e-mail evaluated it as more personally relevant and more interesting. Moreover, their overall evaluation of the intervention e-mail letter was significantly higher than that of the control group participants.

This study is of particular relevance for two reasons. First, the intervention in this study was, as one of the few computer-tailored smoking cessation interventions [11, 19, 32–34], implemented via the Internet. Computer-tailored interventions that are web-delivered can vary in terms of tailoring [11]. In the current study, a simple design was used, in which participants were able to fill in an online questionnaire and received their tailored information by e-mail. The study therefore provided smokers with not just a computer-tailored intervention but also the possibility to use the program on any computer at any time without other requirements (e.g. CD-ROM). Furthermore, the e-mails provided additional feedback about action planning for smoking cessation. The importance of planning in facilitating quitting has been demonstrated in recent studies [38, 39] and plays an important role in several theories and models [56–59]. This is the first study to date that has used this concept of action planning in an expanded and elaborated form within a tailored smoking cessation e-mail intervention. Results revealed that action planning did not predict 24-hour and 7-day point prevalence abstinence. This might, however, be explained by the fact that we measured participant’s intention to plan certain strategies and did not measure whether participants had already executed these plans. It is conceivable that a number of participants, especially those in the preparation phase, had already carried out action plans such as planning a quit date and informing people in the environment about the quit attempt. These actions seem likely to predict successful quitting, though they were not measured in our study. For this reason, conclusions on the influence of action planning on quitting cannot be drawn on the basis of our study. More research, therefore, is needed to study whether execution of plans can facilitate quitting and which executed plans one would benefit from the most. Finally, further research is also needed on the benefits of tailored smoking cessation feedback including action plan feedback over and above tailored smoking cessation feedback without action plan feedback.

Although in the current study, a single e-mail intervention was used, other studies showed beneficial effects of multiple tailoring (e.g. [34, 37, 55]). No evidence exists yet on how best to provide additional feedback moments, and research is needed to illuminate this question. We were, however, interested in the efficacy of the computer-tailored smoking cessation intervention as it is currently offered to the Dutch general population (i.e. single advice e-mail), extended with tailored action plan feedback, and therefore, did not choose such a study design.

Limitations

This study is subject to some limitations. First, biochemical verification of the self-reported abstinence could not be undertaken owing to the geographical spread of the sample. The announcement of possible cotinine validation, however, was expected to yield a bogus pipeline [60]. Because this study did not include personal contact with a counselor, and thus had a low demanding nature, self-report was considered valid [61].

Second, we did not measure prolonged abstinence, which is sometimes proposed as an alternative or preferred method instead of point prevalence [62]. Prolonged abstinence can be defined as abstinence between two follow-up moments or as abstinence after a certain grace period (preferably a 2-week period). In order to prevent high attrition rates, we conducted our first follow-up after 6 months. This implies that at the 6-month follow-up, participants would have to remember whether they quitted smoking 2 weeks after receiving the intervention. Smokers’ recollection about smoking
some weeks ago may, however, not be optimal [62]. Velicer and Prochaska [50] demonstrated a strong relationship between four outcome measures: 24-hour point prevalence abstinence, 7-day point prevalence abstinence, 30-day prolonged abstinence and 6-month prolonged abstinence. Furthermore, they recommended 24-hour and 7-day point prevalence abstinence as the preferred outcome measures. An argument for the use of 7-day point prevalence abstinence is furthermore that this measure can capture delayed effects of an intervention [62].

Third, and in line with others [32, 63, 64], our study was subject to high loss to follow-up (57.4%). This was caused by several factors, such as invalid e-mail accounts (resulting in approximately 10% dropouts) and spam filters. Another explanation might be that smokers who have successfully quit may not want to be reminded of their former smoking behavior [18]. We applied an intention-to-treat procedure [63, 65], and although this procedure can cause distortions or weaken results, the study still showed that significantly more participants in the intervention group reported not having smoked in the last 24 hours and the last 7 days. Furthermore, effect sizes (OR) are still comparable to the effect sizes as reported by Noar et al. [4] in their meta-analysis of print-tailored health behavior change interventions. The high loss to follow-up resulted in a threat to the power required for this study. It is recommended that future e-health research anticipate relatively high dropout rates to prevent a similar problem to the one we encountered.

Fourth, we asked participants to evaluate the e-mail feedback letter 6 months after receiving this e-mail. This time frame might be too long for precise recall of the content of the e-mail, and a shorter follow-up period to conduct a process evaluation is preferable. Only data, however, from participants who claimed to have read the e-mail were considered when we examined the process measures.

Another limitation of this study may appear to be the lack of more relevant social influence measures, such as the social influence of friends factor. Although we could not include this measure in the effect analyses, we did, however, provide tailored feedback about influence of friends based on individual scores on self-efficacy and action plan items (e.g. ‘Are you confident that you can stay quit when someone offers you a cigarette?’; ‘Do you plan to inform people in your environment about your quit attempt?’).

Conclusions

The results of our study demonstrate the efficacy of an e-mail-delivered computer-tailored smoking cessation intervention. Because we did not include smokers with low motivation to quit, the encouraging results cannot be generalized to the overall Dutch smoking population. Further research is needed into the efficacy of the intervention for smokers who are very low or not motivated to quit smoking. Also, further research is recommended on the surplus value of (multiple) e-mail-delivered tailored action plan feedback over and above tailoring without action plan feedback. Our study provided important insight into the effectiveness of the e-mail-delivered computer-tailored intervention including action plan feedback and we conclude that this intervention is effective for the Dutch smoking population moderately to highly motivated to quit smoking.

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Conflict of interest statement

None declared.
E-mail-delivered computer tailoring for smoking cessation

References


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Appendix A: Action plan scale

Quitting smoking can be dealt with in several ways. Below you find an outline of possibilities
Which possibilities would you use?
Do you plan to

- Break/change smoking-related routines?
- Never smoke again, not even a puff?
- Read information about smoking cessation?
- Do something else when you crave a cigarette?
- Think about how to prevent weight gain?
- Think of difficult situations you might encounter after quitting?
- Remove all tobacco products from the house?
- Plan a quit date?
- Quit immediately without cutting back first?
- Reward yourself after quitting?
- Inform people in your environment about your quit attempt?
- Use smoking cessation aids?
- Avoid difficult situations that you might encounter after having quit smoking?
- Make no-smoking agreements with your housemates?
- Remove all ashtrays from the house?
- Ask your guests not to smoke when you have only just quit?
- Quit together with someone else?

Answer categories: 1 = definitely not, 2 = not, 3 = neutral/I do not know, 4 = yes and 5 = yes, definitely.