FACTORS ASSOCIATED WITH SUCCESSFUL SMOKING CESSATION AMONG PARTICIPANTS IN A SMOKING CESSATION PROGRAM INVOLVING USE OF THE INTERNET, E-MAILS, AND MAILING-LIST

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Objective The objective was to clarify factors, including Internet-accessed advice for smoking cessation, associated with smoking cessation among participants of the *Quit Smoking Marathon* (QSM), a one-month smoking cessation program involving use of e-mails and a mailing-list.

Methods The subjects were 88 volunteers who aimed to quit smoking and completed the QSM program. Those who remained abstinent from smoking at 1 year thereafter were defined as successful quitters. Factors associated with successful smoking cessation were examined by multiple logistic regression analysis adjusted for confounders and separately for use of nicotine replacement therapy (NRT).

Results Successful smoking cessation was reported by 49 subjects (55.7%). For the NRT-free group, sending 10 or more e-mails to the mailing-list was significantly associated with successful smoking cessation [odds ratio: 10.7, $P=0.015$].

Conclusion Frequent e-mailing to the mailing-list followed by obtaining personal advice is an effective way to quit smoking among QSM participants not using NRT.

Key words: smoking cessation, Internet, e-mail, mailing-list, Fagerstrom Test for Nicotine Dependence, nicotine replacement therapy

I. Introduction

Since few smokers are able by themselves to find and use effective smoking cessation aids[1], it is essential for preventive medicine practitioners to facilitate easy access to smoking cessation support. Recent developments in computer and information technology could provide a solution by ensuring availability. For instance, an e-mail mailing-list can readily enable people keen on smoking cessation to come together from various places, overcoming the disadvantages of group therapy. It has been reported that the enrollment of participants and their consistent participation is difficult with the latter, although it is advantageous in increasing the probability of quitting smoking and is cost-effective[2].

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Takahashi et al.[3] have introduced a smoking cessation program —the *Quit Smoking Marathon* (QSM)— that maximizes use of the Internet and e-mails to provide behavioral support for smoking cessation. The QSM consists of a home page on the World Wide Web (WWW), daily guidance e-mails, and a mailing-list. This mailing-list including various advisers, i.e., medical workers and ex-smokers, in particular, distinguishes the QSM from other computer-mediated smoking cessation programs. The majority of these programs are termed computer-tailored programs and use computers for collecting participants' characteristics, which in turn are introduced into an algorithm, which generates messages tailored to the specific needs of each participant[4]. The QSM was designed to eliminate limitations with regard to time and place, which are the disadvantages encountered with group therapy. Thus, the participants can directly receive counseling from the advisers on not only medical evidence but also personal experiences of ex-smokers.

The outline of the QSM has been previously documented[3]. However, participants' characteristics associated with successful smoking cessation

have not been reported. The aim of this study was to clarify factors associated with smoking cessation among QSM participants. In particular, we wanted to focus on the dose-response association between e-mailing to individuals on the mailing-list, through which the participants obtained behavioral support for smoking cessation, and the success rate.

II. Subjects and methods

Subjects

In this study, we analyzed the data for participants of the QSM conducted in August 1998 because at that time there was no restriction of e-mailing to the mailing-list for personal advice. In contract, the QSMs conducted thereafter imposed strict limitations on the numbers of e-mails which could be sent to the individuals on the mailing-list for efficient running of the program. The aim of the present study was to determine the relationship between the number of e-mails sent and success in smoking cessation and thus evaluate the effectiveness of e-mailing as a method for obtaining behavioral support.

Volunteer participants were enrolled through an announcement posted on the homepage on the WWW. A total of 95 people indicated their interest in participation via e-mail. Participation in the QSM required the fulfillment of the following conditions: a participant should (1) be able to communicate in Japanese; (2) be over 20 years of age; (3) be able to use e-mail; (4) be able to pay 5,000 JPY as the participation fee; (5) not be under treatment for and have no possible diagnosis of hyperthyroidism, menopausal problems, schizophrenia, insomnia, and mood or other severe psychiatric disorders; and (6) not be in the perinatal period. One of the authors (Y.T.) sent an e-mail to 95 volunteers to confirm that they fulfilled all the above conditions. Six people did not reply to the e-mail and one withdrew from participation before the start of the QSM because of a computer-related issue. Thus, the program encompassed a total of 88 participants.

Ethics

Informed consent was obtained via e-mail from all the study participants and the study protocol was approved by the Ethical Committee of Nara Women's University.

Methods

Details of the QSM

The QSM was a one-month smoking cessation program which consisted of a home page on the WWW, a mailing-list, and daily guidance e-mails from the conductor. The home page was created to provide helpful information regarding smoking cessation and to call for the participation. The mailing-list provided the means to jointly sharing information. Any e-mail sent to the mailing-list was forwarded to all those who were registered on the list. All participants of the QSM were enrolled on the mailing-list that was exclusively established for the QSM and was available 24 h a day for a 1-month period. In principle, the participants were allowed to send only one e-mail per day to express their feelings about smoking cessation, in order to ensure serious introspection. However, they were able to send rescue e-mails for help in case they could not endure the withdrawal symptoms of nicotine dependence and to avoid upsetting the participants, the conductor, in fact, did not caution those who broke the above regulations in terms of e-mailing. Ex-smokers as well as medical advisers were included in the mailing list for providing support and to give suggestions. The ex-smoker advisers provided advice based on their personal experiences when attempting to quit smoking, while the medical advisers stressed the medical point of view.

The conductor e-mailed daily guidance that the participants on the mailing-list were expected to read. The guidance e-mails included the minimum requirements needed for successful smoking cessation, with information on smoking-related harm to health, advantages of quitting smoking, withdrawal symptoms of nicotine dependence, and management of withdrawal symptoms.

Study variables

Before starting the QSM, the following baseline information for all the participants was obtained by e-mail: sex, age, years of smoking experience, the score of the Fagerstrom Test for Nicotine Dependence (FTND)[5], previous attempts at smoking cessation (any or none), and years of e-mail experience. The FTND is a six-item questionnaire that mainly evaluates the physical aspect of nicotine dependence and yields a score ranging from 0 to 10, in order of ascending dependence. An FTND score of 7 was defined as the cut-off point in this study; a higher score indicated heavy nicotine dependence. Fagerstrom and colleagues, the developers of the FTND, did not make a categorization related to success at smoking cessation. However, an FTND score of 7 or more is thought to be associated with severe withdrawal symptoms, great difficulty in quitting, and possibly the need for the highest doses of nicotine supplements[6]. The total number of e-mails that each participant sent to the mailing-list during the program was counted by the conductor after the QSM was concluded. The participants were questioned whether they used nicotine replacement therapy (NRT) during the one-month program period after the end of the QSM. Those who used nicotine gum

and/or patches, regardless of the dose and period, were defined as NRT users in the present study. Only two forms of NRT were available at that point of time in Japan: the Japanese Ministry of Health, Labour and Welfare had not given approval for other types of nicotine replacement drugs (e.g., nasal sprays and sublingual tablets) for smoking cessation. To obtain nicotine gum and/or patches, the participants had to receive a prescription from a doctor and usage of NRT depended on the needs of each participant. Of the 88 subjects, 41 were NRT users (NRT group).

Definition of smoking cessation

Smoking status was examined 6 months and 1 year after the QSM ended. Participants answered via e-mail whether they had abstained from smoking since the QSM ended. In the present study, the participants who answered in the affirmative on both occasions were defined as successful (abstainers), the others being classified as relapsers. Biochemical methods for determination of smoking status, such as expired carbon monoxide[7,8], were not adopted.

Statistical analysis

The NRT-free and NRT groups were separately examined because of the following mechanisms of NRT in attempts at smoking cessation[9]. A low and safe dose of nicotine provided to smokers is reported to decrease the withdrawal symptoms, which helps smokers to cope with the behavioral aspects of nicotine dependence. Thus, it was speculated that a different demand for behavioral support might exist between the two cases.

The Fisher's exact test was used to compare the profiles and the number of participants succeeding in quitting smoking between the NRT-free and NRT groups, as well as to examine the participants' characteristics associated with a successful outcome. Additionally, multiple logistic regression analysis was performed for controlling confounding effects. The statistical level of significance was calculated using SPSS 13.0J for Windows (SPSS Japan Inc., Tokyo, Japan) and $P<0.05$ (two-tailed) was considered significant.

III. Results

The subjects' profiles are summarized in Table 1. The mean (standard deviation) FTND score was 5.9 (2.3). Comparison between the NRT-free and NRT groups revealed a borderline significance of difference in the FTND score and in the number of e-mails sent to the mailing-list. The NRT-free group had more participants with an FTND score of 6 or less, while the NRT group tended to send more e-mails. No significant differences were observed with regard to sex, age, years of smoking experience, previous attempts at smoking cessation, and years of e-mail experience between the NRT-free and NRT groups.

Table 1. Profiles of the subjects

		NRT-free group	NRT group	*P* value
		N (total=47)	N (total=41)	
Sex	Male	38(80.9%)	28(68.3%)	0.220
	Female	9(19.1%)	13(31.7%)	
Age[a]	20–39 years	27(57.4%)	19(46.3%)	0.287
	40 years or older	19(40.4%)	22(53.7%)	
Years of smoking experience[b]				
	Less than 19 years	23(48.9%)	16(39.0%)	0.380
	20 years or more	21(44.7%)	23(56.1%)	
Score of the Fagerstrom Test for Nicotine Dependence[c]				
	6 or less	30(63.8%)	18(43.9%)	0.073
	7 or more	14(29.8%)	20(48.8%)	
Previous attempts at smoking cessation[d]				
	Experienced	27(57.4%)	25(61.0%)	0.828
	Not experienced	18(38.3%)	15(36.6%)	
Years of e-mail experience[a]				
	Less than 1 year	11(23.4%)	15(36.6%)	0.244
	1 year or more	35(74.5%)	26(63.4%)	
Number of e-mails sent to the mailing-list				
	Less than 10	31(66.0%)	18(43.9%)	0.053
	10 or more	16(34.0%)	23(56.1%)	

Note. *P* values were calculated with the Fisher's exact test. The numbers of missing responses were as follows: (a) one in the NRT-free group; (b) three in the NRT-free group and two in the NRT group; (c) three, both in the NRT-free and NRT groups; and (d) two in the NRT-free group and one in the NRT group.

Of the 88 subjects, 49 (55.7%) were successful in smoking cessation. No significant difference was found between the NRT-free (51.1%) and NRT (61.0%) groups ($P=0.395$).

In the NRT-free group, the subjects who sent 10 or more e-mails to the mailing-list were more frequently successful than those who sent less than 10 e-mails (Table 2), even after adjusting for sex, age, the FTND score, and previous attempts to quit (Table 3). Other study variables were not significantly associated with successful smoking cessation.

In the NRT group, a greater number of subjects with an FTND score of 6 or less quit smoking as compared to those with an FTND score of 7 or more (Table 4). However, multiple logistic regression analysis adjusted for sex, age, previous trial for smoking cessation, and the number of e-mails to the

Table 2. Abstinence rates in the NRT-free group (N = 47) classified by study variable

		% of abstainers	*P* value
Sex	Male	44.7	0.137
	Female	77.8	
Age[a]	20–39 years	40.7	0.080
	40 years or older	68.4	
Years of smoking experience[b]			
	Less than 19 years	43.5	0.246
	20 years or more	61.9	
Score of the Fagerstrom Test for Nicotine Dependence[b]			
	6 or less	56.7	0.521
	7 or more	42.9	
Previous attempts at smoking cessation[c]			
	Experienced	37.0	0.071
	Not experienced	66.7	
Years of e-mail experience[a]			
	Less than 1 year	63.6	0.497
	1 year or more	48.6	
Number of e-mails sent to the mailing-list			
	Less than 10	35.5	0.005
	10 or more	81.3	

Note. *P* values were calculated with the Fisher's exact test. The numbers of missing responses were as follows: (a) one subject, (b) three subjects, and (c) two subjects.

Table 3. The odds ratio, 95% confidence interval (CI), and *P*-value for the number of e-mails sent to the mailing-list with reference to successful smoking cessation in the NRT-free group

Number of e-mails sent to the mailing-list	Odds ratio (95% CI)	Significance
Less than 10	1.00	$P=0.015$
10 or more	10.7(1.58, 72.8)	

Note. The odds ratio, the 95% confidence interval (CI), and the *P*-value were estimated by multiple logistic regression analysis adjusted for sex, age, the Fagerstrom Test for Nicotine Dependence score, and experience of previous attempts of smoking cessation. NRT: nicotine replacement therapy.

mailing-list showed that this difference was of borderline significance (Table 5). No significant associations were found for the other study variables.

Table 4. Abstinence rates in the NRT group (N = 41) classified by study variable

		% of abstainers	*P* value
Sex	Male	60.7	1.000
	Female	61.5	
Age	20–39 years	63.2	1.000
	40 years or older	59.1	
Years of smoking experience[a]			
	Less than 19 years	62.5	1.000
	20 years or more	65.2	
Score of the Fagerstrom Test for Nicotine Dependence[b]			
	6 or less	83.3	0.020
	7 or more	45.0	
Previous attempts at smoking cessation[c]			
	Experienced	46.7	0.177
	Not experienced	72.0	
Years of e-mail experience			
	Less than 1 year	46.7	0.194
	1 year or more	69.2	
Number of e-mails sent to the mailing-list			
	Less than 10	72.2	0.218
	10 or more	52.2	

Note. *P* values were calculated with the Fisher's exact test. The numbers of missing responses were as follows: (a) two subjects, (b) three subjects, and (c) one subject.

Table 5. The odds ratio, 95% confidence interval (CI), and *P*-value for the Fagerstrom Test for Nicotine Dependence (FTND) score with reference to successful smoking cessation in the NRT group

FTND score	Odds ratio (95% CI)	Significance
6 or less	1.00	$P=0.054$
7 or more	0.21(0.04, 1.03)	

Note. The odds ratio, the 95% confidence interval (CI), and the *P*-value were estimated by multiple logistic regression analysis adjusted for sex, age, experience of previous attempts at smoking cessation and the number of e-mails sent to the mailing list. NRT: nicotine replacement therapy.

IV. Discussion

The present study indicated that, among QSM participants, the only one of the factors examined to demonstrate association with smoking cessation was the number of e-mails sent to the mailing-list in the NRT-free group and the FTND score in the NRT

group.

In the case of the NRT-free group, the number of e-mails sent to the mailing-list was positively associated with successful smoking cessation. This result is in line with the finding by Zhu et al.[10] of a positive dose-response relationship with the number of telephone counseling sessions for abstinence. We speculate that frequent communication results in more receipt of personal advice, which in turn aids successful smoking cessation. Coincidently, the present study indicated that the NRT-free group sent e-mails to the mailing-list less frequently, possibly because participants unable to overcome severe withdrawal symptoms resumed smoking rather than sending e-mails for assistance. Providing numerous opportunities for counseling may be particularly important for those attempting to quit tobacco consumption without NRT. Conversely, NRT users may not need recourse to e-mails for urgent assistance because their withdrawal symptoms are under better control.

Several groups have examined whether e-mailing is helpful in accomplishing smoking cessation. One randomized trial revealed effects of an online discussion group and e-mail messages on smoking cessation which persisted for 3 months[11]. Another non-randomized study indicated that an online interactive program for smoking cessation could be improved by tailored follow-up e-mails[12]. Although the method of using e-mails differed among the surveys, in general, it can be stated that e-mailing is an effective medium for supporting smoking cessation.

In the NRT group, those with an FTND score of 6 or less tended to be more frequently successful in smoking cessation, although this was of borderline significance when controlling for confounders. A negative relationship between the FTND score and abstinence rate was also reported among volunteer users of nicotine inhaler[13]. The FTND score might thus be a reliable predictor among those attempting to quit smoking with the aid of NRT. In the present study, the cut-off score of 6 was considerably higher than that obtained in an observational study of young community-dwellers: the study indicated that an FTND score of 3 or less best predicted smoking cessation[14]. This could imply that the QSM is an effective smoking cessation program for those with a high level of nicotine dependence. The difference in the FTND scores, however, might alternatively be explained by the different attitudes toward quitting smoking. If the participants of the QSM were sufficiently strong-willed to quit smoking, this would result in a higher cut-off score. On the other hand, it could be suggested that the heterogeneity with regard to NRT use among the NRT group influenced the association between the FTND score and successful smoking cessation. Some participants with a high FTND score, i.e., a high level of nicotine dependence, might have been unable to sufficiently control the nicotine withdrawal symptoms because of insufficient use of NRT, which could have resulted in failure in smoking cessation. This would lead to overestimation of the negative association between the FTND score and successful smoking cessation. However, information on dosage and its period of use was not available in the present study and therefore appropriate adjustment could not be made.

Although sex, age, years of smoking, and experience of previous attempts to quit smoking have often been reported as factors associated with successful smoking cessation[15], this was not confirmed here. One possible reason is that the number of subjects was not large and the statistical power was consequently low. Future studies involving a larger number of subjects are needed to clarify this issue.

The number of years of e-mail experience was not associated with successful smoking cessation, implying that the QSM is also effective in case of people who are inexperienced in using e-mails.

The subjects of the present study may not be representative of the general population with regard to sex, age, and the degree of nicotine dependence. Calculation using the data of the National Nutrition Survey indicated that in 1997, the number of male smokers was approximately five-times larger than that of female smokers, and the percentages of smokers <40 years and >40 years were approximately 45% and 55%. Compared with this, in our study, the number of females and young people was relatively high. A similar tendency was also seen in other computer-mediated smoking cessation programs[12,16]. It is reasonable that young people are more familiar with the use of computers than middle-aged or older individuals. The distinct feature of the QSM, i.e., exchanging information by e-mailing to a mailing-list, would be expected to attract young and female smokers. In this study, nicotine dependence of the subjects approved heavier than the average FTND score of approximately 3 for population samples reported earlier[17~19]. Smokers with a low level of nicotine dependence might attempt to quit smoking without special support.

In the present study, the rate of smoking cessation observed was high; 51.1% in the NRT-free group and 61.0% in the NRT group. However, it would be presumption to conclude that the QSM was particularly effective in assisting smoking cessation without taking differences in characteristics of participants into account. The QSM program required a participation fee and the participants must have

contemplated quitting smoking. One could argue that some participants submitted a false self-report with regard to their smoking status and that the authors were unable to confirm this because of the absence of biological methods of evaluating the smoking status. Although the mailing-list provided an advantage in terms of a large number of people from various areas being able to participate in a virtual group therapy, the collection of biological data from the subjects was not feasible. However, a review reported that false reporting rates with regard to smoking status are generally low[20]. It should be pointed out that false self-reporting may lead to overestimation of the effects of e-mailing on success with smoking cessation, especially if the NRT-free group subjects who sent 10 or more e-mails to the mailing-list empathized with the advisers and the conductor and returned the false socially-desired answer. To rule this out as far as possible, the concordance between the replies to the questions on smoking cessation and the contents of the e-mails sent to the mailing-list was checked and the smoking status of participants who showed inconsistency was confirmed. This process can eliminate false reporting about success in smoking cessation. Based on the present findings, the factors related to smoking differ with NRT use. Since the decision regarding NRT was taken independent of the advisers and the conductor, there was no psychological pressure on participants to report false results about successful smoking cessation.

The other limitation faced in the present study was the possibility that the findings could have been obtained as a result of a random variation because of the small number of the subjects. However, the present findings are in line with previous studies. Successful smoking cessation might be affected by unmeasured factors such as unreported treatment of diseases, socioeconomic status[21], spouse smoking status[21], psychological stress at worksites[22], and family doctors with whom subjects might consult about smoking cessation. Our findings thus need to be replicated in future studies assessing these factors.

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