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Influence of recruitment strategy on the reach and effect of a web-based multiple tailored smoking cessation intervention amongst Dutch adult smokers

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## **Abstract**

*Introduction* This study investigated the influence of two different recruitment strategies on the reach and effect of a web-based multiple tailored smoking cessation program.

*Methods* From May 2009 until June 2010, Dutch adult smokers were recruited via mass media or general practices. Those who completed the baseline questionnaire were followed up during six weeks (two follow-ups). Differences between the two samples were assessed regarding baseline characteristics, retention rates, quit attempts and 24-hour point prevalence abstinence.

*Results* Smokers recruited via general practices (N=409) were significantly lower educated, less addicted, more motivated to quit smoking and to maintain non-smoking, more often female and more often suffering from cardiovascular or respiratory diseases than mass media respondents (N=1154). They showed higher retention rates and were more likely to report a quit attempt (64.3 vs. 50.7%) and abstinence (43.3 vs. 33.1%). Behavioral effects became non-significant when controlling for experimental condition and baseline differences.

*Conclusion* More respondents could be recruited via mass media, while general practices respondents showed higher retention rates and were more successful in quitting smoking. The choice for a particular recruitment strategy appeared to determine the number and type of smokers recruited and might consequently influence the intervention's potential public health impact.

## **Introduction**

The smoking of tobacco is the most preventable cause of illness and premature death in the world [1, 2]. To aid smokers to quit successfully, effective computer tailored smoking cessation programmes have been developed [3, 4] that are increasingly delivered online [5, 6]. Using the Internet as a medium for delivering these programmes has clear advantages for both provider and receiver. The Internet enables health promoters to reach a large audience against minimal costs and for participants these programmes are convenient as they can take part at any time their schedule and mood allows it [7]. A recent review showed that smoking cessation interventions delivered through the Internet can indeed be effective [8, 9]. However, the public health impact of these interventions is not only dependent on their effect, but also on their reach [10].

Now that the Internet is becoming an increasingly popular medium for delivering health behavior change programs, it is important to investigate how recruitment and retention rates for web-based interventions can be optimized. Although online advertising has been suggested to be able to achieve relatively high recruitment rates [11], it is not yet clear whether all segments of the smoking population, such as smokers with a low socio-economic status [12-14], can be successfully reached via the Internet. Previously, recruitment via general practices has been shown to be successful in reaching smokers with a low socio-economic status for participation in a computer tailored smoking cessation intervention [15], but whether recruitment via (online) mass media is able to match this ability remains yet unknown.

The present study investigated whether recruitment via general practices and recruitment via (online) mass media resulted in different samples of smokers, with regard to size and demographic characteristics, participating in a web-based multiple tailored smoking cessation program. In addition, potential differences between the two samples in retention rates and in smoking behavior measured after a short follow-up period were examined.

## **Methods**

### *Recruitment and procedure*

From May 2009 until June 2010, smokers aged 18 years or older were recruited to participate in a randomized controlled trial to test the effectiveness of a web-based multiple computer tailored smoking cessation program. Smokers motivated to quit within six months, able to understand Dutch sufficiently, and with access to the internet were eligible for participation. Two recruitment strategies were used. First, recruitment via 80 practice nurses working in Dutch general practices. All practice nurses were provided with instructions on how to recruit their smoking patients. Desk displays, recruitment letters, recruitment texts for general practices' websites, business cards, and posters were available and incentives were sent to each practice nurses who had recruited five and ten patients, respectively. On average, €6266,40 was spent on recruitment via general practices (€78,33 per practice). Secondly, recruitment took place via mass media channels, such as regional newspapers, advertisements, an online social network website

(Hyves) and online smoking cessation forums. In total, €1190 was spent (all on advertising).

After giving informed consent, participants were randomly allocated to either the control condition (i.e. usual care) or an experimental condition. Randomization took place at respondent level and was done by a computer software randomization device.

### *Intervention*

The web-based multiple computer-tailored smoking cessation program was based on the I-Change model [16] and on a previously developed effective single computer-tailored intervention [17]. All respondents were prompted by e-mail to fill in an online questionnaire at baseline, two days after a set quit date, and at six-week follow-up. One week after receiving their first invitation, a reminder e-mail was sent to respondents who had not yet filled out the particular follow-up questionnaire. For respondents in the intervention group, questions were interchanged with tailored feedback messages to maintain the respondent's attention and to improve retention rates. Feedback messages were tailored to several respondent characteristics [16] such as gender, (non-)smoking-related beliefs (i.e. attitude, social influence and self-efficacy), intention to quit smoking, goal and relapse prevention strategies (i.e. action and coping plans), and smoking behaviour. After completion of each questionnaire, feedback messages were combined into a personalized feedback letter. These letters were available for respondents on their

computer screen and were sent to them by e-mail. A more extensive description of the intervention components is provided elsewhere [18].

### *Questionnaire*

Data collection occurred online. After completing the baseline questionnaire, all respondents were prompted by e-mail to fill in two online follow-up questionnaires: two days after the quit date each respondent was asked to set at baseline and at six-week follow-up. Questionnaires were based on the I-Change model [16] and tested experimentally in previous studies among Dutch smoking adults [15, 17, 19].

### *Baseline measurement*

*Four demographic variables* were measured at baseline: age, gender, educational level and nationality.

*The occurrence of cardiovascular or respiratory diseases, diabetes or cancer* was measured by four dichotomous items, asking whether the respondent suffered from these diseases or not. Whether the respondent was *pregnant* was measured by one dichotomous item.

*Addiction level* was measured by the abbreviated Fagerström Test for Nicotine Dependence (FTND) (0 =not addicted); 10=highly addicted) [20].

*Number of previous quit attempts* was assessed by asking respondents how often they had tried to quit smoking in the past.



*Intention to quit smoking* was measured by one item asking respondents whether or not they intended to quit smoking (1=definitely not; 7=definitely yes).

*Intention to maintain non-smoking* was measured by one item asking respondents if they intended to maintain non-smoking once quit (1=definitely not; 7=definitely yes).

#### *Follow-up measurement*

Two days after their set quit date, respondents were asked whether they had undertaken a *quit attempt* or not. Retention at this first follow-up was defined as still being in the study, measured by whether or not the respondent filled out this follow-up questionnaire.

At six-week follow-up, *24-hour point prevalence abstinence* was assessed by asking whether the respondent had refrained from smoking during the last 24 hours. Retention was again defined as still being in the study, measured by whether or not the respondent filled out the six-week follow-up questionnaire.

#### *Analyses*

Data were analyzed using SPSS 15.0. Baseline differences between the two groups were assessed using Chi-square tests (for categorical variables) and T-tests (for interval variables), including all respondents who initially signed up for the study.

To investigate the influence of recruitment method on retention rates, logistic regression analyses were conducted with retention at the first and second follow-up as dependent variables, including all respondents who met inclusion criteria. First, we aimed to univariately assess the influence of recruitment method on retention. Therefore, the

first model only consisted of recruitment method. Secondly, we investigated whether its influence remained significant after controlling for experimental condition and baseline differences between the samples. In the second model, therefore, experimental condition and baseline differences between the two groups were included as potential covariates.

To determine whether the two samples differed with regard to quit attempts and 24-hour point prevalence abstinence, logistic regression analyses were conducted. The first model again only consisted of recruitment method, while in the second model experimental condition and baseline differences between the samples were included as potential covariates. In a third model, interactions between recruitment method and baseline differences between the two samples were included as well..

## **Results**

### *Differences in recruitment rates and respondent characteristics*

Via general practices, 409 eligible smokers were recruited, resulting in €15,32 (€6266,40/409) spent per smoker recruited. Via the mass media approach, 1154 smokers were recruited, resulting in €1,03 (€1190/1154) spent per smoker recruited.

Table 1 shows the baseline characteristics of the sample recruited via general practices and the sample recruited via mass media, respectively. Respondents recruited via general practices were significantly lower educated and less addicted, and had a higher intention to quit smoking and to maintain non-smoking than their mass media counterparts. The general practice sample consisted of significantly fewer men and of

more respondents reporting a cardiovascular or respiratory disease compared with the mass media sample.

Based on these findings, analyses investigating the influence of recruitment method on retention and abstinence rates were controlled not only for experimental condition, but also for gender, educational level, addiction level, intention to quit smoking, intention to maintain non-smoking and for the occurrence of cardiovascular and respiratory diseases. Additionally, with regard to abstinence rates, interaction effects between recruitment method and each of the factors mentioned were studied.

#### *Differences in retention rates*

Of the 1154 eligible respondents recruited via mass media, 601 (47.8%) were retained at the first (two days after their set quit date) and 454 (36.1%) at the second (six weeks after baseline) follow-up. For the sample recruited via general practices (N=409) retention rates were 263 (59.8%) and 210 (47.7%) respectively.

Table 2 shows that retention at the first follow-up could significantly be predicted by recruitment method: significantly fewer respondents recruited via mass media than respondents recruited via general practices remained in the sample. However, when controlling for experimental condition and baseline differences between the two samples, the effect of recruitment method became non-significant. The level of addiction, however, appeared to be a significant predictor of retention. That is, respondents who

were relatively more addicted to nicotine were less likely to remain in the study than those who were less addicted.

Similar results were found with regard to retention at the second follow-up: significantly fewer respondents remained in the sample when they were recruited via mass media than when they were recruited via their general practice. Again, this effect became non-significant when controlling for experimental condition and baseline differences between the samples, while the level of addiction did significantly predict retention. Again, respondents who were more addicted to nicotine were less likely to remain in the study than those who were less addicted. In addition, gender and the occurrence of cardiovascular diseases turned out to be significant predictors of retention at the second follow-up. Female respondents and respondents with a cardiovascular disease significantly more often retained in the study than male respondents and respondents without a cardiovascular disease.

#### *Differences in smoking behavior: quit attempts and abstinence*

At first follow-up, 169 (64.3%) respondents within the general practice sample reported having made a quit attempt, while in the mass media sample this percentage was almost 14% lower ( $\chi^2=13.48$ ,  $p<.001$ ). For every smoker having made a quit attempt, €3,90 (mass media recruitment) and €37,08 (general practice recruitment) was spent. Table 3 shows that respondents recruited via general practices were more likely to report having made a quit attempt than those recruited via the mass media. However, after controlling

for experimental group and baseline differences between the samples this effect became non-significant. Experimental condition, however, was a significant predictor of making a quit attempt: compared to respondents in the control group, respondents in the intervention group were significantly more likely to have made a quit attempt. Addiction level was another significant predictor of quit attempts: respondents who were more addicted to nicotine were less likely to have made a quit attempt than those who were less addicted. Furthermore, a higher intention to quit smoking at baseline significantly predicted whether a quit attempt was made.

At second follow-up, 91 (43.3%) respondents recruited via general practices and 151 (33.1%) respondents recruited via mass media reported having refrained from smoking during the last 24 hours ( $\chi^2=6.49$ ,  $p<.001$ ). For every smoker reporting 24 hour point prevalence abstinence, €68,86 (general practice recruitment) and €7,88 (mass media recruitment) was spent. Table 3 shows that those recruited via general practices were significantly more likely to report being abstinent than those recruited via mass media. However, this effect became non-significant when controlling for experimental group and baseline differences between the samples. Respondents in the intervention group were significantly more likely to report abstinence than respondents in the control group. Moreover, those with a low level of education were more likely to be abstinent than those with a medium level of education. Respondents who were more addicted to nicotine were less likely to be abstinent than those who were less addicted, as were respondents with a respiratory disease compared with those without such a disease.

Interactions between recruitment method and baseline characteristics were investigated, but none were of significant influence on quit attempts or 24-hour point prevalence abstinence ( $p > .1$ ) (data not tabulated).

## **Discussion**

### *Main findings*

The first objective of the present study was to investigate whether smokers recruited for participation in a web-based computer tailored smoking cessation program using a mass media approach differed from smokers recruited via general practices. Mass media recruitment yielded a significantly larger sample of smokers than recruitment via general practices, while less money was spent per respondent recruited. Respondents recruited via mass media were significantly higher educated, more addicted to nicotine, less motivated to quit smoking and to maintain non-smoking, and suffered less from respiratory and cardiovascular diseases than those recruited via general practices. The first two of these findings are in line with a previous study that found that respondents recruited via the web, which is one of several available mass media, were relatively higher educated and more addicted [21]. However, in absolute numbers, more smokers with a low level of education were recruited via mass media than via general practices. This appears to be in contradiction with the idea that online and mass media recruitment might not be successful in recruiting smokers with a lower socio-economic status [22, 23]. The general practice may thus be the most suitable gateway for recruiting

respondents when the target group consists of smokers with a low socio-economic status in particular, but when one's target group consists of smokers, including but not limited to lower socio-economic status smokers, mass media recruitment might be a better strategy. Etter and Perneger (2001) also found that smokers recruited online were younger and more motivated to quit smoking [21], while we did not find any age differences and respondents recruited via mass media appeared to be less motivated to quit than those recruited via general practices. This latter finding could potentially be explained by selection bias; practice nurses might have invited only those smokers to participate who were, in their opinion, sufficiently motivated to quit. Another difference found between the samples was that more respondents with cardiovascular and respiratory diseases were present amongst those recruited via general practices than amongst those recruited via mass media. An explanation could be that people with such chronic diseases visit their GP more frequently [24] than smokers without any noticeable health complaints.

The second objective of our study was to investigate the influence of recruitment strategy on retention rates. Although the number of respondents included using a mass media approach was considerably higher, retention rates were significantly higher in the sample of smokers recruited via general practices. In line with the relatively high rates of attrition found in many web-based interventions (with attrition rates ranging up to 73%) [8, 25-28], only 48% of the respondents recruited via the mass media could be retained at the first follow-up, while 36% of them was still in the study at the second follow-up. Within the general practice sample, retention rates were much higher (60% and 48%, respectively). This might be explained by the assumed social bond between smokers and

their practice nurse [29]. As interventions are supposed to have the largest effect on behavior when fully completed, preventing smokers from dropping out of these programmes is highly relevant. Previously, personal contact with a health professional via e-mail, online or via short message services (SMS) has been shown to be conducive to health behaviour change [5] and the involvement of a health professional might also be promising in keeping up retention rates. However, the practice nurses' involvement within the general practice sample could not prevent that in both samples respondents who were relatively more addicted were more likely to discontinue their participation in the intervention. The level of addiction has previously been associated with lower success rates [30, 31]. It might thus be that in our study respondents who were relatively more addicted failed to quit smoking and therefore, as is also assumed by the using the recommended intention-to-treat approach [32, 33], dropped out of the study.

Thirdly, we investigated the influence of recruitment strategy on success rates. Although less money was spent per smoker making a quit attempt and per smoker reporting to be abstinent within the mass media sample, we showed that respondents recruited via general practices were relatively more likely to report having made a quit attempt and being abstinent from smoking than those recruited via the mass media. As previous research already showed the benefits of a health professionals' involvement in smoking cessation interventions with regard to smoking cessation outcomes [5, 34, 35], this may be explained by the involvement of practice nurses in recruiting these smokers. However, in the present study, the effect of recruitment method on quit attempts and abstinence mainly seemed to be caused by the effect of the intervention and by baseline differences between the samples.



### *Study limitations*

The study presented is subject to several limitations. First of all, smokers recruited via their general practice had a chance to receive a single tailored counseling session by a practice nurse as part of the intervention offered. As only 80 out of more than 8000 Dutch general practices [36] participated in our study, it was not possible to provide respondents recruited via mass media with the same opportunity. This difference in intervention components might have influenced who agreed to take part in the study and, as a consequence, may have been partially responsible for the differences found in baseline characteristics between the two samples. Retention and success rates, however, were less likely to be affected by the difference in intervention components as the measurement of both retention and success occurred before counseling sessions took place (i.e. after completion of the six-week follow-up questionnaire). Second, it would have been valuable to include multiplicative functions of the intervention's reach and effect in both samples to determine the intervention's public health impact, as  $\text{impact} = \text{reach} \times \text{effect}$  [10, 11, 37, 38]. However, even though we know how many smokers enrolled in the intervention via both recruitment methods, it was unknown how many smokers were invited to participate via each method, thus participation rates ('reach') could not be calculated.

### **Conclusions**

The findings presented suggest that different recruitment strategies attract different types of smokers for participation in a web-based smoking cessation intervention. Recruitment via general practices may attract smokers who are more likely to quit smoking (e.g. less addicted, more motivated to quit and more likely to complete the intervention), while recruitment using a mass media approach may ultimately lead to a larger absolute number of smokers quitting smoking, as more smokers can be reached using this strategy, against much lower cost. As a result, the choice for a particular recruitment strategy is expected to influence the potential public health impact of the intervention. The present study suggest that the net impact of the intervention might potentially be higher in the sample recruited via mass media as much more smokers were recruited using this strategy. As, however, retention rates were significantly higher within the general practice sample, future research needs to investigate whether the net impact of the intervention within this sample would also be greater on the long run.

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**Tables**

Table 1. Sample characteristics at baseline for the two samples of Dutch adult smokers recruited from May 2009 to June 2010

	General practice recruitment (N=440)	Mass media recruitment (N=1257)	t (df)	$\chi^2$	p-value
Mean (SD) age	48.6 (12.8)	47.7 (31.6)	.55 (1691)	-	.583
Percent (N) male	40.2 (177)	48.0 (603)	-	7.87	.005
Percent (N) educational level					
High	23.0 (101)	32.5 (408)	-	27.34	<b>.000</b>
Medium	44.8 (197)	46.5 (585)	-		
Low	32.3 (142)	21.0 (264)	-		
Percent (N) with Dutch nationality	98.0 (431)	97.8 (1229)	-	.05	.822
Percent (N) with cardiovascular diseases	14.3 (63)	9.0 (113)	-	9.85	<b>.002</b>
Percent (N) with respiratory diseases	28.6 (126)	14.6 (184)	-	42.48	<b>.000</b>
Percent (N) with diabetes	4.9	3.4	-	.67	.41
Percent (N) (previously) with cancer	7.1	5.4	-	1.24	.27
Percent (N) pregnant	.7	.5	-	.10	.76
Mean (SD) FTND score	4.2 (0.8)	5.0 (2.5)	-5.64 (1695)	-	<b>.000</b>
Mean (SD) number of previous quit attempts	3.7 (5.8)	4.7 (16.0)	-1.28 (1695)	-	.200
Mean (SD) intention to quit smoking	6.3 (0.8)	6.2 (0.9)	3.92 (1625)	-	<b>.000</b>
Mean (SD) intention to maintain non-smoking	6.1 (0.9)	5.9 (1.0)	3.40 (1625)	-	<b>.001</b>

Note: p-values &lt; .05 are marked bold

Table 2. Predictors of retention at the first (2 days after the set quit date) and second (6 weeks) follow-up in Dutch adult smokers recruited from May 2009 to June 2010 (N=1563)

	First follow-up		Second follow-up	
	OR	95% CI	OR	95% CI
Recruitment method <sup>a</sup>	<b>1.62*</b>	1.28-2.04	<b>1.63*</b>	1.30-2.04
Recruitment method <sup>a</sup>	1.52	.80-2.90	1.10	.59-2.04
Experimental group <sup>b</sup>	1.19	.94-1.50	.99	.78-1.25
Sex <sup>c</sup>	.86	.68-1.08	<b>.78*</b>	.62-.99
Medium educational level <sup>d</sup>	.98	.72-1.34	1.07	.78-1.47
High educational level <sup>d</sup>	.72	.52-1.01	1.11	.79-1.56
Addiction level	<b>.93*</b>	.88-.98	<b>.94*</b>	.89-.99
Intention to quit	1.12	.93-1.34	.93	.78-1.13
Intention to maintain non-smoking	.99	.84-1.16	1.09	.92-1.28
Cardiovascular diseases <sup>e</sup>	1.31	.88-1.97	<b>1.80*</b>	1.21-2.69
Respiratory diseases <sup>e</sup>	1.03	.74-1.43	1.20	.86-1.68

Note: <sup>a</sup>mass media recruitment is the reference category; <sup>b</sup>the control group is the reference category; <sup>c</sup>female respondents are the reference category; <sup>d</sup>a low educational level is the reference category; <sup>e</sup>not suffering from the disease is the reference category; \*p<.05; p-values < .05 are marked bold.

Table 3. Predictors of quit attempts and 24-hour point prevalence abstinence (ppa) in Dutch adult smokers recruited from May 2009 to June 2010 (N=1563)

	Quit attempts		24-hour ppa	
	OR	95% CI	OR	95% CI
Recruitment method <sup>a</sup>	<b>1.74*</b>	1.29-2.35	<b>1.55*</b>	1.10-2.16
Recruitment method <sup>a</sup>	2.22	.90-5.46	2.15	.82-5.65
Experimental group <sup>b</sup>	<b>1.52*</b>	1.08-2.13	<b>1.97*</b>	1.31-2.96
Sex <sup>c</sup>	1.01	.72-1.42	1.26	.84-1.89
Medium educational level <sup>d</sup>	1.21	.78-1.87	<b>.52*</b>	.30-.91
High educational level <sup>d</sup>	.98	.60-1.59	.74	.41-1.33
Addiction level	<b>.91*</b>	.85-.98	<b>.91*</b>	.83-.99
Intention to quit	<b>1.85*</b>	1.40-2.45	1.13	.81-1.56
Intention to maintain non-smoking	1.07	.85-1.35	1.16	.88-1.53
Cardiovascular diseases <sup>e</sup>	.62	.35-1.08	.63	.32-1.21
Respiratory diseases <sup>e</sup>	.87	.54-1.40	<b>.49*</b>	.26-.92

Note: <sup>a</sup>mass media recruitment is the reference category; <sup>b</sup>the control group is the reference category; <sup>c</sup>female respondents are the reference category; <sup>d</sup>a low educational level is the reference category; <sup>e</sup>not suffering from the disease is the reference category; \*p<.05; p-values < .05 are marked bold.

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