

Evidence-based redesign of a tailored Internet programme for smoking prevention

Padlina, Jimmy, Bauer

- Oliver Padlina, PhD

Institute of Social and Preventive Medicine, University of Zurich, Zurich, Switzerland;
Swiss Federal Institute of Sports, Swiss Federal Office of Sports, Magglingen,
Switzerland.

- Gerda Jimmy, MSc

Institute of Social and Preventive Medicine, University of Zurich, Zurich, Switzerland;
Swiss Federal Institute of Sports, Swiss Federal Office of Sports, Magglingen,
Switzerland.

- Georg Bauer, MD DrPH

Institute of Social and Preventive Medicine, University of Zurich, Zurich, Switzerland;
Center for Organizational and Occupational Sciences, Federal Institute of Technology,
Zurich, Switzerland.

Institution where work was performed:

Institute of Social and Preventive Medicine, University of Zurich, Zurich, Switzerland

ABSTRACT

Background: Data from the year 2005 show that 77% of 14 to 19 year-olds in Switzerland used the Internet several times per week [1]. Health professionals thus make increasing use of the Internet to promote health behaviour changes.

Objective: The aim of this study was to analyse user behaviour of an Internet-based smoking prevention programme (www.feelok.ch) in order to optimise the structure of the programme.

Methods: Number and lengths of visits for three different versions of the smoking prevention programme were recorded. Version 1 consisted of two sections: general information in the first and stage-matched feedback in the second section. In order to encourage more visits to the stage-matched intervention, the section with general information was removed for version 2. The resulting decrease in the number of visits made it necessary to reintegrate a section with general information into the smoking prevention programme (version 2.1). However, to avoid shortcomings of version 1, the structure of the home page of the programme was slightly changed.

Results: In version 1, where the general and stage-specific information on smoking were presented as two distinct sections, only 32% (295/month) of the visits involved the stage-specific intervention for 12 minutes on average. The results with version 2 of the smoking prevention programme (where the general section was removed) showed that the number of visits to the stage-specific intervention doubled (650/month) and the average length of a visit increased from 12 to 17 minutes. However, the overall number of visits decreased by about 31%. The reintegration of the section with general information and the new structure of the home page of the smoking prevention programme (version 2.1) produced a marked increase in the number of visits (from 650 to 996 on average every month). In version 2.1, 72% of the visits (compared to 32% for version 1) involved the stage-specific section for 16 minutes on average.

Conclusions: Best results were gained when a section with general information was offered in addition to the stage-specific section, yet its link was put in a less prominent position.

INTRODUCTION

The increasing access to and use of the Internet by adolescents opens up a new path to reaching young target groups in public health. In their survey with 7th grade students in Southern California, Sun *et al.* [2] found that 99% of respondents had access to the Internet, and adolescents with more psychosocial risk factors or detrimental health behaviours were more likely to use the Internet. Furthermore, Hanauer *et al.* [3] found that young people search the Internet for health topics more than any other group. In the field of smoking cessation, Etter [4] found in his user study that a wide range of different websites were being accessed by smokers, yet their quality was rated as rather poor. Reviews on Internet-based smoking prevention programmes also found room to improve regarding the content, design, and tailoring of information [5,6,7]. Randomized trials on the efficacy of Internet-based smoking cessation programmes indicate some success [8,9,10,11]. Some authors found better results for computer-tailored counselling [12], or for websites which attracted higher visitor numbers and repeat visits [13,14]. In the 1990's Prochaska's Transtheoretical Model of Behaviour Change, which describes 5 stages of behaviour change, was increasingly used as a theoretical basis for smoking cessation programmes. Evidence mounted showing that interventions, which provided tailored feedback according to a person's stage of change, proved more successful than interventions in which every participant received the same information [15,16,17,18].

Therefore, an Internet-based health programme for adolescents aged 12 to 18 was developed at the University of Zurich from 1999 to 2001. It addresses several health behaviours and includes sections which provide stage-specific feedback based on the Transtheoretical Model. According to the evidence mentioned above [15,16,17,18], it was assumed that the stage-specific components of the feelok programme had the potential to be more effective than the provision of general health information. This assumption has in the meantime been confirmed by an Internet-based randomised controlled trial,

which compared web-based tailored smoking cessation materials with web-based non-tailored materials. The tailored condition was found to be more effective [12]. This evidence raises the question of how an Internet-based smoking prevention programme should be designed to achieve both high overall user numbers and a high proportion of users in the stage-specific section of the programme.

Internet health programme feelok

The web-based feelok intervention programme (www.feelok.ch) offers eight modules to date: cannabis, smoking, stress, self-confidence, sexuality, nutrition, alcohol, and physical activity. Each module contains general information about the respective topic. Various methods are used to present the content to the target group: texts, games, tests, animations, forums, as well as other interactive elements. Throughout the programme the language is kept simple and neutral with no slang expressions. Care has been taken that the content is presented in a non-judgemental way. Worksheets are also available free of charge to facilitate the use of feelok in schools. In addition, the programmes on cannabis, smoking, physical activity, alcohol and stress offer a stage-specific intervention, primarily based on the Transtheoretical Model. Young people who would like to change their behaviour are guided through the process of attaining their target behaviour. For those who have no motivation to change, on the other hand, possible reasons are examined and individual feedback is given to foster the intention to change.

The feelok health programme is promoted through a variety of measures: workshops with teachers, brochures and posters distributed at school, stickers in toilets at school, networking with nationally renowned institutions for each health topic, links on other websites, magazine and newspaper articles, and presentations during congresses or events.

The user profile of the entire feelok programme was studied from November 2004 to June 2005 via online surveys (unpublished data). Of the visitors taking part in the surveys

(n = 9271) 54% were female, and 85% between 10 and 19 years old. About 35% of these users had visited the feelok programme more than once. The majority of users knew about feelok through their teacher and used the programme at school. Other promotional strategies seemed to have little effect in attracting users.

Data from the years 2003/04 showed that on average about 22% of genuine feelok users (this means those who looked at the website for at least 3 minutes) visited the smoking prevention programme.

Tested versions of the smoking prevention programme

The current study evaluated the smoking prevention component of the feelok programme. Version 1 of this programme comprised a general and a stage-specific section, to each of which a link was placed on the starting page. The link for general information led to texts, games, tests or animations relevant to anyone, for example information on financial, legal and health aspects of smoking.

The link to the stage-specific section led to a page with a description of and link to each of the stages of behaviour change. Adapted from Pallonen et al.'s nine stage version of the Transtheoretical Model [19], seven stages of smoking behaviour were defined for this intervention addressing the following target groups: 1) Young people who do not smoke and do not intend to start smoking 2) Young people who do not smoke but think they might try it out at some stage 3) Those who smoke occasionally 4) Regular smokers who do not intend to quit 5) Regular smokers who would like to quit 6) Young people who smoke regularly but are committed to give up 7) Young people who stopped smoking in the past. The link to each stage provided personalised feedback. Stage 4 for example had a strong focus on one's perceived advantages and disadvantages of smoking while stage 6 stressed strategies to quit smoking.

As the number of visits for the stage-specific section of the smoking prevention programme was found to be low, the set up of the programme was changed. Version 2 thus consisted of a stage-specific section alone in which the information from the

previous general section had been integrated into each stage. This means, the independent general section was removed. The starting page was now the one with a description for each stage of behaviour change.

In version 2.1 the general section was re-introduced but its link was placed at the end of the starting page in order for the stage-specific section to stand out more. Visitors thus had to read the description of all 7 stages first, before reaching the last description on the page, which was a link to the general section. Figure 1 shows a screen shot of the starting page for this newest version.

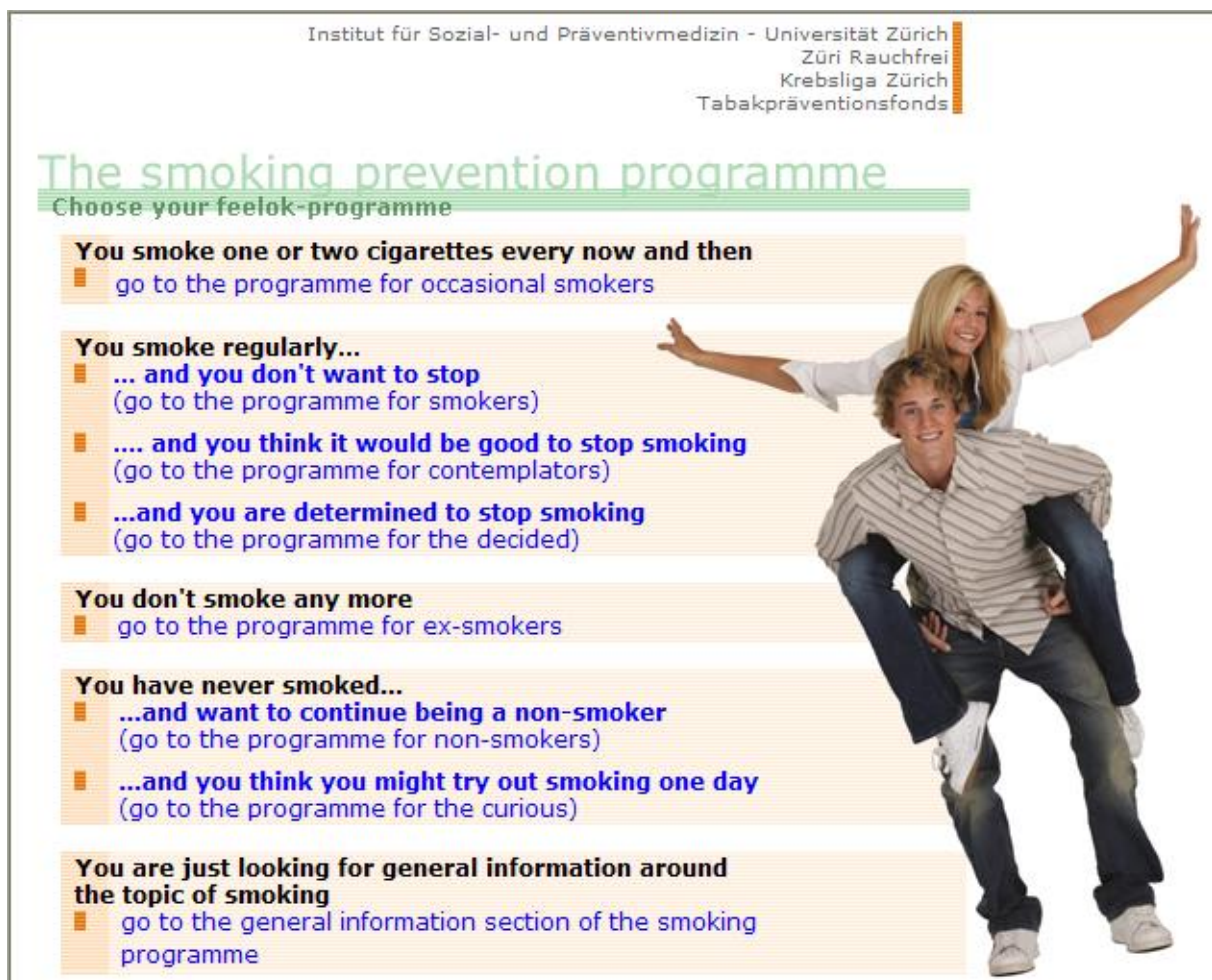


Figure 1: Screen shot of the starting page for version 2.1 of the feelok smoking prevention programme.

Aim of the study and research question

The aim of this study was to determine how an internet-based smoking prevention programme should be designed to achieve both high overall user numbers and a high proportion of users in the stage specific-section of the programme and what consequences this may have for designing behaviour change websites in general. The research question was thus how the three versions of the smoking prevention programme differed in terms of number of visits, duration of visits, and distribution of visits across the 7 stages of change.

METHODS

Feelok is freely available on the Internet and is also promoted for use in school classes. The study sample encompasses all spontaneous users of the smoking prevention programme during three study periods rather than a selected group. The study periods were: September 2003 to September 2004 for version 1, January to March 2005 for version 2 and April to June 2005 for version 2.1. The average number of visits per month was taken as the unit to be compared between the three versions to account for the differences in length of study period for each version. During these periods, visitors themselves chose what section of the programme and what stage they wanted to engage in. User behaviour was recorded with a statistics programme, which was designed with Macromedia Flash Version 6 and worked in conjunction with ASP-Files and an access database. Thus only the number and length of visits to the Internet programme was recorded and no other data about the users.

SPSS was used to analyse the data. Independent sample T-tests were used to compare the duration of visits between different versions. Wilcoxon-Mann-Whitney tests were used to compare the number of visits to the stage specific section and the distribution of visits across the seven stages of behaviour change between different versions. Data were standardised in order to draw comparisons between version 1 and the other 2 versions to account for the difference in total visits to the feelok programme as a whole, i.e. visits to any health topic of the programme (The number of visits in version 1 was multiplied by

1.14 because 14% more visits were recorded to any feelok health topic of the feelok programme from January to June in 2005 as compared to the same period in 2004). The number of total visits between version 2 and version 2.1 was comparable.

RESULTS

Number of visits

For version 1, 295 visits a month (including all visits, which lasted at least 3 minutes) were recorded for the stage-specific section of the smoking prevention module. As seen in figure 2, the number of visits for the stage-specific section (all stages) increased significantly for version 2 (650 a month, $P = 0.02$) and version 2.1 (719 a month, $P = 0.05$). However, for version 2 this increase was coupled with a remarkable drop in the overall number of visits. For version 2.1, on the other hand, the number of overall visits was even slightly higher than for version 1 (996 visits monthly compared to 956 visits for version 1).

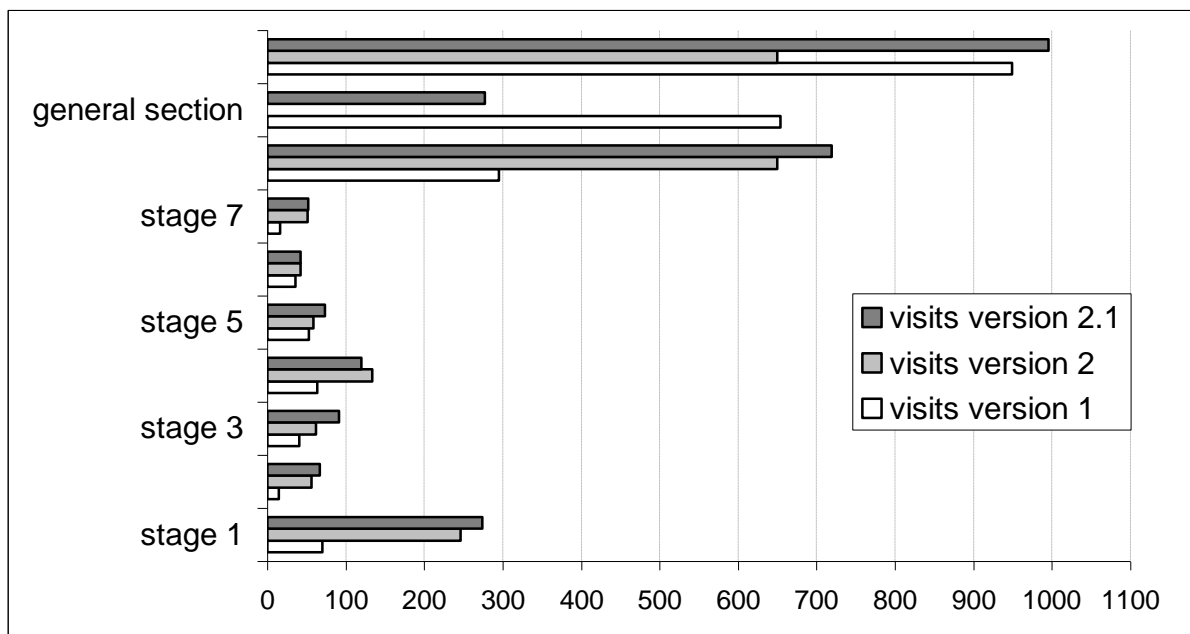


Figure 2: Number of genuine visits a month (visits lasting more than 3 minutes and less than 4 hours) for versions 1, 2 and 2.1 .

Regarding each individual stage, there were only small differences in numbers of visits between versions 2 and 2.1. These two versions scored better than version 1 for every stage, particularly stages 1, 2, and 7 where the number of visits was tripled or even quadrupled.

Duration of visits

From version 1 to version 2, the average duration of visits across all stages increased significantly from 12 minutes to 17 minutes ($P < 0.001$). Increases for individual stages were at least 3 minutes and up to 9 minutes depending on stage (see table1). Only for stage 6, there was no notable increase in duration.

Table 1: Comparison of user statistics for version 2.1 and previous versions of the smoking prevention programme (A1/A2/A2.1 = Average duration of a visit in minutes – version 1/2/2.1; I1 = Hours of intervention per month (= number of visits which last at least 3 minutes x average duration of a visit) – version 1 (standardised figures), I2/I2.1 = Hours of intervention per month – version 2/2.1)

	A1	A2	A2.1	I1	I2	I2.1
General section	21	-	23	229	-	105
Stage 1	10	18	20	12	73	91
Stage 2	10	17	9	2	16	10
Stage 3	10	17	16	7	18	25
Stage 4	12	16	15	13	35	29
Stage 5	13	16	14	11	16	17
Stage 6	17	18	16	10	13	4
Stage 7	11	20	14	3	16	12
All stages	11.9	17.3	16	58	187	188
Both sections	18.2	-	17.6	287	-	293

From version 1 to version 2.1, the average duration of visits across all stages also increased significantly from 12 minutes to 16 minutes ($P < 0.001$).

For stage 1, 3, 4 and 7, the visits for version 2.1 lasted longer than those for version 1. For the other stages there were small or no remarkable differences (< 3 minutes).

Hours of intervention were also calculated by multiplying the number of visits with the average duration of a visit. As seen in Table 1, a remarkable increase was recorded for the overall hours of engaging in the stage-specific intervention between version 1 and the other two versions. The tailored programme of version 2 was visited for an average of 187 hours per month in total. However, with the lack of a general section, version 2 records a loss of 100 hours of intervention overall. In version 2.1, finally, visits for the general section were regained: users for version 2.1 spent 188 hours per month in total working through the tailored programme and 293 working through the overall smoking prevention programme.

Stage distribution

When comparing how the visits to the stage-specific section are distributed among the seven stages, very similar patterns are seen again for version 2 and version 2.1. However, differences can be seen between version 1 the other two versions as seen in figure 3.

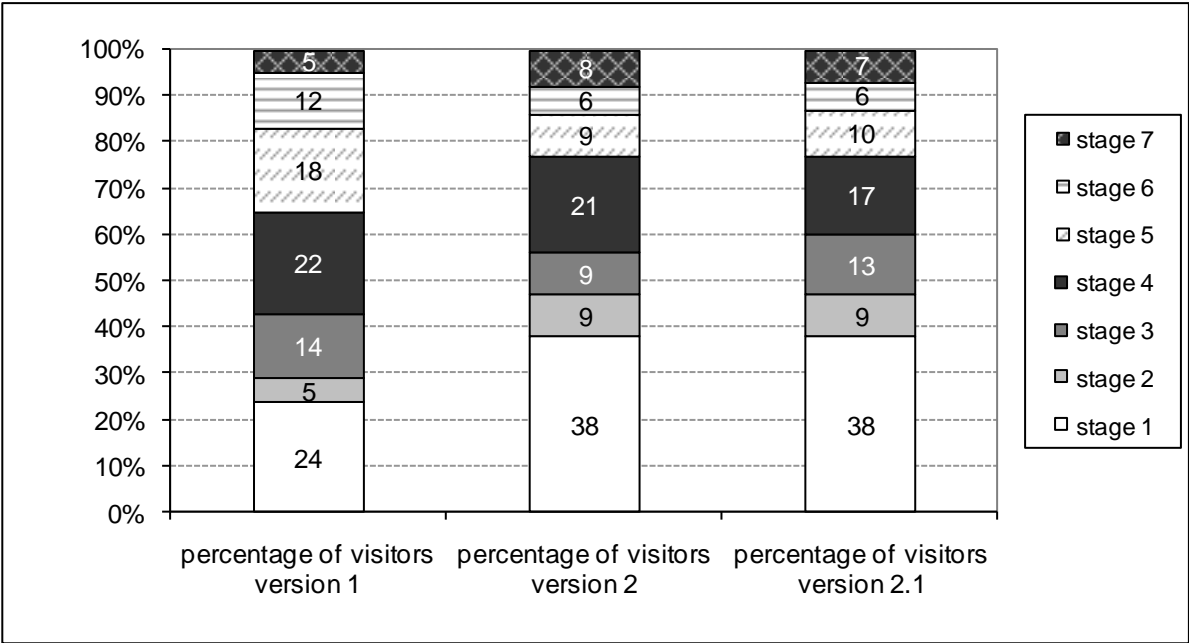


Figure 3: Percentage distribution of visits to the stage-specific section for each stage in version 1 (n = 295), version 2 (n = 650) and version 2.1 (n = 719).

The percentage of visits to stage 1 was 24% for version 1 while it was 38% for the other two versions (both $P < 0.001$). Percentages for stages 5 and 6 on the other hand were higher for version 1 than versions 2 and 2.1. Eighteen percent of visits to the stage-specific section in version 1 chose stage 5 compared to 9 and 10% for the other two versions (both $P < 0.001$). For stage 6, 12% of visits were recorded in version 1 and 6% in the other two versions (both $P < 0.001$). It is to be noted, however, that the absolute number of visits for stages 5 and 6 was nevertheless slightly lower for version 1 compared to the other two versions because the overall number of visits to the stage specific section was much higher for versions 2 and 2.1 (see figure 1).

DISCUSSION

Research in the 90's showed that tailored interventions in the area of smoking prevention were frequently more effective than general information on the topic [15,16,17,18].

Therefore, a stage-specific section was offered in version 1 of the feelok smoking prevention programme in addition to the section of general information. While the design of 7 separate individualised interventions was very time-consuming, it was considered worth the effort taking into account the expected increase in effectiveness. The data showing that only 1/3 of the visits for version 1 included work with the stage-specific section for relatively short time periods were thus somewhat disappointing. It was consequently decided that the general information section should no longer be a separate entity but integrated in the stage-specific section so that users would concentrate on the stage-specific intervention.

The redesign of the website resulted indeed in more than double the number of visits to the stage-specific section of the smoking prevention programme. However, a decrease of 31% of visits to the smoking prevention module was also recorded after the two sections

had been merged. It thus appears that a substantial number of users were not prepared to choose a specific stage to work through the programme. Based on these findings, the structure of the home page was redesigned for a second time. A separate section with general information was reintegrated into the programme (version 2.1). This time, the link to the general section was placed last on the list of the starting page so that visitors had to read through the description of the seven stages first before reaching the link to the general section. In this way, their attention was steered towards the stage-specific section.

Version 2.1 held up to expectations as the number of visits for the stage-specific section remained similar as for version 2 while the overall number of visits increased remarkably to reach a similar number as version 1. Visitor statistics of version 2.1 show clearly how important small changes in the structure of a website can be to reach one's target group. This confirms findings by Danaher, McKay and Seeley [20], who pointed out that the structure of a website is an important but often overlooked factor influencing the effectiveness of behaviour change programmes based on the Internet.

The results regarding the duration of visits and overall hours of intervention for each version confirm that version 2.1 has the highest intervention potential. The average duration of visits to the tailored section increased as compared to version 1 and remained similar as in version 2. Likewise, the hours of intervention on the stage-specific section for version 2.1 were more than tripled as compared to version 1, yet without any loss in overall intervention hours for the programme including both sections.

Interestingly, a look at the distribution of visits to the stage-specific section among the seven stages may make the impression that version 1 is to be favoured over the other two versions. Version 1 shows higher percentages for stages 5 and 6 which are the regular smokers who are prepared to quit, thus the primary target group for this kind of behaviour change programme. However, when comparing absolute numbers we note

that versions 2 and 2.1 succeeded in attracting slightly higher numbers of visits for these two stages due to the much higher numbers of visits to the stage-specific section as a whole.

External factors which may have influenced visitor behaviour cannot be ruled out in this kind of study. While no measures were taken to advertise the smoking prevention programme during the entire study period, a variety of methods were used to promote the feelok health prevention programme as a whole in both years, 2004 and 2005 and these strategies remained the same throughout the entire period. Differences in number of visits to feelok as a whole, i.e. all of the health topics taken together were adjusted for in the analysis. In addition, the similarity between the overall number of visits for versions 1 and 2.1, and between the stage distributions for versions 2 and 2.1 imply that the differences presented in the results section may mainly be attributed to the changes of the structure of the Internet programme.

Consideration has to be given to the fact that more recent evidence casts some doubt on the superiority of stage-specific interventions compared to non-tailored interventions. Two reviews which assess studies investigating the effectiveness of interventions based on the Transtheoretical Model for smoking alone came to contradicting conclusions. While Spencer *et al.* [21] found strong evidence in support of the model, Riemsma *et al.* [22] did not. In their review, only one out of eleven trials comparing stage-specific interventions with non-stage based interventions showed significantly better results for the stage-specific condition. Furthermore, no support for the use of stage-specific interventions was found in three reviews targeting smoking as well as other behaviours [23,24,25]. These findings underline the importance of offering both, stage-specific as well as general information on a health intervention website as varying target groups may respond better to one or the other. This is supported by Etter's study [4] which found that the users liked general information on the health risks of smoking, information on medication, testimonies of other quitters, forums and chats, as well as personal tips

on quitting smoking including live counsellors. A review of Internet-based smoking cessation programmes found a lack of websites that provided tailored feedback [5]. Only one randomized controlled Internet-based trial was found, which compared a stage-specific web-site with a general one. The stage-specific programme showed better success [12]. While the current study only provides information about user behaviour, further studies comparing the effectiveness of the general section with the stage-specific section of this programme would provide important information to add to the evidence base on the effectiveness of stage-specific interventions, particularly those offered via Internet.

Practice Implications

Stage-matched behaviour change interventions according to the Transtheoretical Model of Change are increasingly being offered via the Internet.

This study shows that a remarkable proportion of users prefers reading general information rather than working through stage-matched programmes, thus underlining the fact that an Internet-based programme should also include a section with general information in addition to the stage-matched programme. However, not only the content of such a programme but also the structure influences user behaviour. As seen in this study, visitors' interest in the stage-matched intervention of the programme can be fostered by changing the design of the starting page.

In conclusion, findings to date show that version 2.1 is superior to the other two versions. A high proportion of our visitors to the smoking prevention programme were not ready to choose a stage to work with. To reach these people, Internet programmes need to provide sections with general information, even if they are possibly less effective than tailored feedback. However, care has to be taken that the general section does not divert users who would be prepared to choose a stage to work with.

Our results show that small changes in web design can have significant consequences and this underlines the importance to accompany the development of an Internet programme with adequate evaluation studies to better correspond to the needs of the target group. While the availability of data on all users during the study periods provided invaluable feedback on the design of the programme, further studies would be needed to evaluate the effectiveness of each section of this smoking prevention programme.

REFERENCES

Bridle C, Riemsma RP, Pattenden J *et al.* Systematic review of the effectiveness of health behavior interventions based on the transtheoretical model. *Psychology & Health* 2000;20:283-301.

Bock BC, Graham AL, Schiamanna CN, *et al.* Smoking cessation treatment on the Internet: Content, quality and usability. *Nicotine & Tobacco Research* 2004;6:207-219.

Butler CC, Rollnick S, Cohen D *et al.* Motivational consulting versus brief advice for smokers in general practice: a randomized trial. *British Journal of General Practice* 1999;49: 611-616.

Cheh JA, Ribisl KM, Wildermuth BM. An assessment of the quality and usability of smoking cessation information on the Internet. *Health Promotion Practice* 2003;4:278-287.

Danaher BG, McKay HG, & Seeley JR. The information architecture of behavior change websites. *Journal of Medical Internet Research* 2005;7:Art.No. e12.

DiClemente CC, Schlundt D, & Gemmell L. Readiness and stages of change in addiction treatment. *The American Journal on Addictions* 2004;13:103-119.

Dijkstra A, De Vries H, & Roijakkers J. Targeting smokers with low readiness to change with tailored and nontailored self-help materials. *Preventive Medicine* 1999;28:203-211.

Etter JF. Comparing the efficacy of two Internet-based, computer-tailored smoking cessation programs: A randomized trial. *Journal of Medical Internet Research* 2005;7(1):Art. No. e2.

Etter JF. A list of the most popular smoking cessation Web sites and a comparison of their quality. *Nicotine & Tobacco Research* 2006;8:S1, 27-34.

Federal Office of Statistics (2006). Informationsgesellschaft, Kennzahlen. Nutzung des Internets in der Schweiz. [Statistics of media use. Use of the Internet in Switzerland] from http://www.bfs.admin.ch/bfs/portal/de/index/themen/kultur___medien___zeitverwendung/soc_info/blank/kennzahlen0/01.html

Japuntich SJ, Zehner ME, Smith SS, *et al.* Smoking cessation via the Internet: A randomized clinical trial of an Internet intervention as adjuvant treatment in a smoking cessation intervention. *Nicotine and Tobacco Research* 2006;8:S1, 59-67.

Hanauer D, Dibble E, Fortin J *et al.* Internet use among community college students: implications in designing health care interventions. *Journal of American College Health* 2004;52:197-202.

Pallonen UE, Velicer WF, Prochaska JO *et al.* Computer-based smoking cessation interventions in adolescents: description, feasibility, and six-month follow-up findings. *Substance Use & Misuse* 1998;33:935-965.

Patten CA, Croghan IT, Meis TM, *et al.* Randomized clinical trial of an Internet-based versus brief office intervention for adolescent smoking cessation. *Patient Education & Counseling* 2006;6(1-3):249-258.

Pike KJ, Rabius V, McAlister A, & Geiger A. American Cancer Society's QuitLink: Randomized trial of Internet assistance. *Nicotine & Tobacco Research* 2007;9(3):415-420.

Prochaska JO, DiClemente CC, Velicer WF *et al.* Standardized, individualized, interactive, and personalized self-help programs for smoking cessation. *Health Psychology* 1993;12:399-405.

Prochaska JO, & Velicer WF. The transtheoretical model of behavior change. *American Journal of Health Promotion* 1997;12:38-48.

Riemsma RP, Pattenden J, Bridle C. *et al.* Systematic review of the effectiveness of stage based interventions to promote smoking cessation. *British Medical Journal* 2003;326:1175-1177.

Schwartz LGH, Noell JW, Schroeder SW, & Ary DV. A randomised control study of a fully automated internet based smoking cessation programme. *Tobacco Control* 2006;15(1):7-12.

Spencer L, Pagell F, Hallion ME *et al.* Applying the transtheoretical model to tobacco cessation and prevention: A review of literature. *American Journal of Health Promotion* 2002;17:7-71.

Strecher VJ, Shiffman S, & West R. Randomized controlled trial of a web-based computer-tailored smoking cessation program as a supplement to nicotine patch therapy. *Addiction* 2005;100:682-688.

Sun P, Unger JB, Palmer PH *et al.* Internet accessibility and usage among urban adolescents in southern California: Implications for web-based health research. *Cyberpsychology & Behavior* 2005;8:441-453.

Sutton S. Back to the drawing board? A review of applications of the transtheoretical model to substance use. *Addiction* 2001;96:175-186.

Walters ST, Wright JA, & Shegog R. A review of computer and Internet-based interventions for smoking behavior. *Addictive Behaviors* 2006;31:264-277.

Woodruff SI, Conway TL, Edwards CC, *et al.* Evaluation of an Internet virtual world chat room for adolescent smoking cessation. *Addictive Behaviors* 2007;32:1769-1786.