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Tailored Interventions to Communicate Stage-Matched Information to Smokers in Different Motivational Stages

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Smokers in stages of low readiness to quit (immotives and precontemplators) and smokers in stages of high readiness to quit (contemplators and preparers) were randomly allocated to 1 of 4 tailored intervention conditions offering outcome information, self-efficacy-enhancing information, both sorts of information, or no information. Data on 1,540 smokers, stratified by stage, were analyzed. The primary outcome measure was stage transition. The hypotheses with regard to stage-matched information for immotives and precontemplators were not verified. With regard to contemplators and preparers, the following was found: Compared with the control group, contemplators benefited the most from both sorts of information, whereas preparers benefited the most from self-efficacy-enhancing information only. Comparisons between contemplators and preparers who were assigned to the matched treatment and contemplators and preparers who were assigned to the mismatched treatment supported these findings.

Self-help interventions in smoking cessation may be useful in lowering the percentage of smokers in the population (Lichtenstein & Glasgow, 1992). However, many smokers are not interested in such interventions, which are mostly directed at people who intend to quit smoking. In The Netherlands, 70% of smokers are not planning to quit within the next 6 months (Mudde, Dolders, & De Vries, 1994). It is conceivable that the impact of an intervention on the smoking rate in the population may be enhanced by also targeting this large group of smokers.

The stages-of-change model (Prochaska, DiClemente, & Norcross, 1992) explicitly recognizes this group of smokers with low readiness to change. The model views behavior change as a process from no readiness to change the behavior to internalization of the new behavior, and it distinguishes between several discrete stages of behavior change. With regard to interventions, first, a stage-matching principle can be derived from the stages-of-change model—different interventions have to be directed at each stage—and, second, the aim of an intervention should be stage transition.

From a theoretical point of view, stage-matched interventions will have to be directed at changing the cognitive determinants that are responsible for the transition from one stage to another. On the basis of earlier (cross-sectional) studies, it was suggested that smokers with low readiness to quit especially need information on outcomes to progress to the next stage, whereas smokers with high readiness to quit especially need self-efficacy-enhancing information (De Vries & Backbier, 1994; Dijkstra, De Vries, & Bakker, 1996). Similarly, according to Janis and Mann (1977), in a sound decision-making process, people first process information on the consequences of changing or not changing the behavior and then process information on how to change the behavior (also see Miller & Rollnick, 1991).

A literature search revealed no study on the differential impacts of outcome information and self-efficacy-enhancing information on behavior change. Especially in the development of stage-matched interventions, there is a need for data on the impact of both sorts of information in interaction with stage of change.

In the present study, an extended version of the original stages-of-change model was used (Dijkstra, Bakker, & De Vries, 1997). Within the group of smokers who are not planning to quit within the next 6 months, smokers in two stages were recognized: immotives, who are not planning to quit within the next 5 years (or planning to never quit), and precontemplators, who are planning to quit within the next 5 years (but not within the following 6 months). Whereas precontemplators are considered to be on their way to the next stage, immotives are considered to be stuck in low readiness. Also, among the smokers who are planning to quit within the next 6 months, smokers in two stages were recognized: contemplators, who are planning to quit within the next 6 months but not within the next month, and preparers, who are planning to quit within the next month (DiClemente et al., 1991). Whereas contemplators are considered to only think about quitting, preparers have decided to quit in the short term. Hence, four groups of smokers with increasing readiness to quit were distinguished: immotives, precontemplators, contemplators, and preparers.

With regard to stage-matched interventions, the findings from De Vries and Backbier (1994) and Dijkstra, De Vries, and Bakker (1996) were extrapolated to the stage model used here. With regard to both extreme groups—immotives and preparers—the

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expectations were as follows: Immotives would benefit most from outcome information only (reasons to quit), whereas self-efficacy-enhancing information (how to quit) would even prove detrimental, by triggering defensive information processing. That is, the strong behavior-changing appeal of the latter sort of information is largely mismatched with these smokers' low readiness to quit. Preparers would benefit most from self-efficacy-enhancing information, whereas outcome information would be highly redundant and therefore inhibit information processing. It was expected that smokers in the intermediate groups—precontemplators and contemplators—would benefit most from the combination of both sorts of information, whereas one or the other type of information would not be enough to stimulate stage transition.

The first goal of this study, which was of mainly practical value, was to assess what sort of information smokers in each stage have to be offered in smoking cessation interventions. Therefore, the effectiveness of each of three experimental conditions was compared, for each stage, with that of a no-information control condition. The conditions offered (a) outcome information only, (b) self-efficacy-enhancing information only, or (c) both sorts of information. In addition, the experimental conditions were compared with each other.

The second goal of this study was to assess whether the principle of stage-matched information—smokers in different stages need different sorts of information—could be demonstrated. Therefore, smokers who were assigned to a stage-matched condition were compared with smokers who were assigned to a stage-mismatched condition.

The primary outcome measure was stage transition, because this measure is by definition an appropriate outcome measure for smokers in all stages (Velicer, Rossi, Prochaska, & DiClemente, 1996). To validate the results obtained with this measure, we also used more conventional measures: intention to quit and a point prevalence abstinence measure.

Method

Participant Recruitment

Smokers were recruited by advertisements in local newspapers throughout The Netherlands. Two groups of smokers were explicitly invited to participate in this study: smokers who were planning to quit within the next 6 months (high readiness to change) and smokers who were not planning to quit within the next 6 months (low readiness to change). They were asked to volunteer for a research project on minimal interventions for smoking cessation, including the possibility of being a control group member. Participants who completed all three questionnaires were offered the opportunity of 10 bonus prizes amounting to $100. After participants had phoned the university to register (N = 1,733), they were sent the pretest questionnaire, which could be returned in a prepaid envelope. After 2 weeks, 1,540 (88.9%) of the pretest questionnaires had been returned (excluding 60 questionnaires that were from pipe or cigar smokers or were filled out incompletely).

Design

Smokers were randomly assigned to one of four conditions: only information on outcomes of quitting (OC condition, n = 384), only self-efficacy-enhancing information (SE condition, n = 385), both sorts of information (BO condition, n = 386), or no information at all (CO condition, n = 385). Participants in the experimental conditions were sent the intervention material by mail, and those in the control condition received a letter in which they were told they would receive no information. Two (T2) and 10 weeks (T3) after the intervention, participants were sent the first and second posttest questionnaires. This article presents the data from T1 and T3 as well as the data on the evaluation of the intervention from T2.

Tailored Feedback

The interventions consisted of computer-generated, individually tailored intervention letters containing the condition-specific sort(s) of information. The computerized system that generated the tailored letters was adapted from a previous evaluation of a minimal intervention with smokers who were planning to quit (Dijkstra, De Vries, & Roijackers, in press). The present intervention consisted of a five- to seven-page individualized report based on the pretest questionnaire scores. Decision rules that were developed in relation to the question "What answer in the questionnaire leads to what information in the intervention?" combined several potential parts of the message into one coherent message. The reports in the three experimental conditions contained the specific sorts of information mentioned in the *Design* section but were tailored to the individual's stage of change, perceived outcomes, situational self-efficacy levels, and smoking behavior. To personalize the letters, we mentioned the name of the individual three times in each letter. Two specific measures were taken to guarantee standardization. First, to prevent the number of pages from exceeding seven, we programmed the expert system to use shorter messages if necessary. Second, although within one condition the contents of message parts varied depending on the individual scores, the same topics were addressed in each letters.

OC condition. In the introduction of these tailored letters, it was stated that readiness is crucial in smoking cessation and that the letter was meant to enhance readiness by stressing the pros of quitting. The letters contained information on possible outcomes of smoking and quitting, including personal health consequences and social consequences, such as a nonsmoking partner's appreciation of smoking cessation and the consequences of smoking for people in the environment. The amount of information presented depended on the individual's scores on the items assessing the expected outcomes. Regarding monetary consequences, the amount of money that would be saved after 1 month and after 1 year of quitting was computed for each respondent. Restructuring information was offered on the negative outcomes of quitting, such as weight gain; loss of the functions of smoking, such as relaxation; and expected withdrawal symptoms. For example, if a smoker anticipated strong withdrawal symptoms, the temporal character of these symptoms was explained in the letter.

SE condition. In the introduction of these tailored letters, it was stated that the active use of skills to quit is crucial in smoking cessation and the letter was meant to enhance the individual's confidence in his or her ability to quit by offering skills that had proved helpful to ex-smokers. The letters contained information on skills to cope with social, emotional, or addictive situations (or all three), depending on the individual's confidence scores. For example, skills, such as coping with cravings, stress, anger, and a depressed mood; with withdrawal symptoms; and with social pressure were addressed. When a smoker reported a lot of confidence in being able to refrain from smoking in a specific situation, the smoker was told this increased his or her chances of success in quitting. When a smoker had moderate or little confidence in being able to refrain from smoking in a specific situation, cognitive and behavioral skills were offered.

BO condition. In the introduction of these tailored letters, a rationale was offered that stressed the importance of both sorts of information. All topics addressed in the letters in the OC and SE conditions were also addressed in this condition.

Measures

Stages of change and stage transition. Stages of change were assessed by confronting smokers with different plans with regard to smoking cessation. Of seven quitting plans, they were asked to indicate "the one quitting plan which best fits your own intention to quit." Smokers who indicated they were planning to quit within the next month were considered to be preparers. Smokers who indicated they were planning to quit within the next 6 months were considered to be contemplators. Smokers who indicated they were planning to quit within the next year or in the next 5 years were considered to be precontemplators. Smokers who indicated they were planning to quit sometime in the future but not in the next 5 years, to smoke indefinitely but cut down, or to smoke indefinitely without cutting down were considered to be immotives. The primary outcome measure was stage transition. This was assessed by dichotomizing changes in stage: Forward transition was scored as 1, and no transition or a backward transition was scored as 0. Participants were considered to be in action when they stated they were engaged in a quit attempt at the time of the measurement.

Intention. To verify the results obtained with the stage transition measure, we used two more common outcome measures. First, intention to quit was measured with a composite of two 10-point scales: "Do you intend to quit smoking?" (responses range from 1 [*not at all*] to 10 [*definitely*]) and "How likely are you to quit smoking?" (from 1 [*not likely at all*] to 10 [*very likely*]). The intention score was the average of both item scores.

Point prevalence abstinence. Second, a more conservative yes/no criterion was used to assess smoking cessation: "Have you smoked in the last seven days (even one puff)?" No biochemical verification of the self-reported quitting behavior was conducted, because it was expected that the announcement of a biochemical verification would increase nonresponse and dropout, especially in smokers who were not planning to quit within the next 6 months (Velicer, Prochaska, Rossi, & Snow, 1992). This would lead to a highly selective group of immotives and precontemplators. Moreover, because half of the sample consisted of these smokers and only a 3-month follow-up was planned, quitting smoking was not considered to be the most important outcome measure (Velicer et al., 1992).

Pros and cons of quitting. Twenty-one items assessed the anticipated physical, social, self-evaluative, and monetary outcomes of quitting. The items could be rated from 0 (*not sure* or *not expecting a certain outcome*) to 3 (*strong expectation of the outcome*). The items were derived from a questionnaire assessing the pros and cons of quitting that had been used in an earlier study on the stages of change (Dijkstra et al., 1996). In that study, the pattern of the pros and cons of quitting through the stages was almost identical to the pattern found with the Decisional Balance measures (Velicer, DiClemente, Prochaska, & Brandenburg, 1985). The present scale assessing the pros of quitting was composed of 15 items referring to the positive outcomes of behavior change. Cronbach's alpha was .87. The scale assessing the cons of quitting was composed of 6 items referring to the negative outcomes of behavior change (α = .57). The average item scores were used as the scale scores. Correlation between the scales was significant but low (r = .24).

Self-efficacy expectations. Seven items assessed participants' in their ability to refrain from smoking in various situations. The items were derived from a questionnaire used in a study on the predictive power of self-efficacy in smoking cessation (Mudde, Kok, & Strecher, 1995). Factor analyses revealed two factors: self-efficacy in coping with social situations (four items, α = .81) and self-efficacy in coping with negative emotions (three items, α = .86). All self-efficacy expectations were measured on a 7-point scale from −3 (*not sure at all that I am able to refrain from smoking*) to +3 (*very sure I am able to refrain from smoking*). The average item scores were used as the scale scores.

Smoking behavior and demographics. Smoking behavior was measured by asking smokers how many years they had been smoking, how many cigarettes they smoked on average, and whether they had engaged in a 24-hr quit attempt in the preceding 12 months. Heaviness of smoking was measured by the Fagerström Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerström, 1991), which assesses smoking habits with six items. The item scores were added, with the minimum possible score 0 and the maximum 10 (α = .71).

Demographics measured were gender; age; and education level, which was categorized as low, medium, or high.

Use of the tailored intervention. To check the extent to which a primary condition for an effect was met, participants were asked at T2, "To what extent did you read the letter?" (responses could range from 1 [*did not read it*] to 10 [*read it all*]).

Statistical Analyses

Because two of the three outcome measures were binary, multivariate testing using a multivariate analysis of variance was not possible. For the binary measures (stage transition and 7 days of cessation) logistic regression was used, and for the quantitative outcome measure (intention to quit) linear regression was used. Sex, age, and level of education were routinely included as covariates in the analyses to increase power by reducing unexplained variance (Robinson & Jewell, 1991). Condition was dummy-coded. All tests were two-tailed, and alpha was set at .05.

First, we tested whether the tailored-intervention conditions had any effect compared with the CO condition in the group of smokers as a whole. Second, the analyses were stratified according to stage. Within each stage, each of the experimental conditions was compared with the no-information CO group. It was expected that in each stage, the hypothesized stage-matched condition would have more effect than the other conditions. Next, the experimental conditions were compared with each other. A match–mismatch test was conducted to test whether smokers who received stage-matched information made more stage transitions, quit more often for 7 days, and had greater intention to quit compared with smokers who received information that was mismatched to their stage. The expectations, as explained in the introduction, are depicted in Table 1. In a manipulation check it was assessed to what extent the conditions led to cognitive changes. Finally, we determined to what extent the smokers had read the intervention materials.

Results

Participant Characteristics, Randomization Check, and Attrition

Of the 1,540 respondents, 59% were female; the average age was 39.7 (SD = 12.2); and regarding level of education, 22% were classified as low, 43% as medium, and 35% as high. The respondents smoked an average of 20.3 cigarettes per day (SD

Table 1
Hypotheses Regarding Stage-Matched and -Mismatched Information Provided to Smokers in Four Motivational Stages

Participant group	n	Matched information	n	Mismatched information
Immotives	310	OC	107	BO, SE
Precontemplators	226	BO	63	OC, SE
Contemplators	197	BO	64	SE, OC
Preparers	116	SE	37	BO, OC

Note. OC = outcome information only; SE = self-efficacy-enhancing information only; BO = both types of information.

= 9.1) and had smoked for an average of 21.8 years (SD = 11.8). The average FTND score was 4.6 (SD = 2.5). Of the respondents, 44.9% had engaged in a serious quit attempt in the last year, and 32.6% were categorized as immotives, 26.6% as precontemplators, 24.2% as contemplators, and 16.6% as preparers. On the cognitive measures, the mean scores on the pros and cons of quitting were 1.59 (SD = 0.6) and 1.26 (SD = 0.6), respectively. Self-efficacy with regard to emotional states and social situations was −0.97 (SD = 1.3) and −0.19 (SD = 1.2), respectively. Finally, the mean score for intention to quit was 5.9 (SD = 2.8).

To check whether the randomization was successful, we compared the four conditions on sex, age, level of education, stage, FTND score, number of cigarettes smoked per day, number of years of smoking, quit attempts in the last 12 months, the pros and cons of quitting, both self-efficacy factors, and intention to quit as measured at T1. As an additional check, the four conditions were compared on scores on the seven quitting plans. Chi-square tests for the discrete variables and F tests for the continuous variables revealed no significant differences between the conditions on any of these variables.

Attrition from pretest (T1) to posttest 2 (T3) was 28.8% (n = 440). Logistic regression analysis with attrition as the dependent variable and the T1 variables involved in the randomization check as predictors revealed significant ($p < .05$) relations: Dropouts were more often male, dropped out more frequently from the CO condition than from the OC and BO conditions, and were more often contemplators or preparers. Table 2 gives the percentages of dropouts by stage and condition.

Because attrition was related to condition and to pretest stage, the analyses without the dropouts might have led to biased results. As a check on such bias, an additional analysis was performed in which dropouts were included and their missing value (T3) was replaced by their last recording (T1 or T2).

Overall Analyses

We first tested whether the tailored-intervention conditions had any effect compared with the CO condition in the group of smokers as a whole. The analyses showed that the experimental conditions led to significant ($p < .05$) increases compared with the CO condition on all three outcome measures, with one exception. Receiving outcome information only did not lead to more 7-day cessation than did receiving no information. In contrast analyses, none of the experimental conditions led to significantly better results than did any of the others. Table 3 and 4 show the effects of condition overall and per stage.

Contrasts of the Experimental Conditions

Immotives. It was hypothesized that immotives would benefit most from the OC condition. Concerning stage transition and the intention to quit, the conditions containing outcome information (the OC and BO conditions) led to significant increases compared with the CO condition. With regard to 7-day smoking cessation, none of the experimental conditions led to significantly more quitting than did the CO condition. In contrast analyses, the experimental conditions did not differ significantly from each other.

Precontemplators. It was hypothesized that precontemplators would benefit most from the BO condition. Concerning stage transition, both conditions containing self-efficacy-enhancing information (the SE and BO conditions) led significantly more often to a stage transition than did the CO condition. All three experimental conditions led to significantly higher intention than did the CO. With regard to cessation of smoking for a week, none of the experimental conditions led to significantly more quitting than did the CO. In contrast analyses, the experimental conditions did not significantly differ from each other.

Contemplators. It was hypothesized that contemplators, like precontemplators, would benefit most from the BO condition. Concerning stage transition and the intention to quit, the experimental condition that presented both sorts of information (the BO condition) led to significant increases compared with the CO condition. With regard to refraining from smoking for 7 days, none of the experimental conditions led to significantly more quitting than did the CO. In contrast analyses, only one contrast was significant ($p < .05$): Contemplators in the BO condition reported greater intention than did contemplators in the SE condition.

Preparers. It was hypothesized that preparers would benefit most from the SE condition. The condition containing self-efficacy-enhancing information only (the SE condition) led to significantly more stage transitions and significantly more 7-day cessation than did the CO condition. None of the experimental

Table 2
Percentages of Dropouts from T1 to T3 by Condition and Transition Stage

Condition	n at T1	Overall (N = 1,540)	Transition stage: Immotives (n = 502)	Precontemplators (n = 409)	Contemplators (n = 374)	Preparers (n = 255)	n at T3
Overall	1,540	28.7	20.1	26.9	33.5	40.6	1,100
Outcome information only	384	23.4	19.5	20.8	29.4	26.4	295
Self-efficacy-enhancing information only	385	29.6	25.9	21.6	31.5	46.4	272
Both types of information	386	26.4	12.7	33	30.4	39.4	284
Control (no information)	385	34.8	23.5	32.4	43.3	47.1	251
n at T3		1,100	401	299	248	152	

Note. T1 = Time 1 (before intervention); T3 = Time 3 (10 weeks after intervention).

Table 3
Intention to Quit at T3 by Stage and Condition: Means and Raw Betas Adjusted for Sex, Age, and Education

Participant group	OC *M*	OC vs. CO *β*	SE *M*	SE vs. CO *β*	BO *M*	BO vs. CO *β*	CO *M*
Overall	5.89	0.61***	5.82	0.60***	6.18	0.89***	5.27
Immotives	3.80	0.74*	3.61	0.53	3.94	0.88**	3.04
Precontemplators	6.38	0.73*	6.66	1.00***	6.79	1.14***	5.66
Contemplators	7.92	0.54	7.57	0.18	8.22[a]	0.84**	7.38
Preparers	7.60	0.18	7.55	0.12	7.98	0.61	7.40

Note. Participants who at T3 stated they had refrained from smoking for 7 days were excluded from the outcome analysis of intention to quit smoking. Condition was dummy-coded. A positive beta indicates that the effect in the experimental group exceeded that of the control group (last column). The betas and means are adjusted for sex, age, and education. T3 = Time 3 (10 weeks after intervention); OC = outcome information; SE = self-efficacy-enhancing information; BO = both sorts of information; CO = control (no information).

[a] Contrast analyses between the three experimental conditions were computed within each stage: Only contemplators in the BO condition had a significantly higher intention to quit than did contemplators in the SE condition.

$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

conditions led to a significantly higher intention to quit than did the CO. In contrast analyses, only one contrast was significant ($p < .05$): Preparers in the SE condition reported more 7-day cessation than did preparers in the OC condition.

Match–Mismatch Test

Smokers who were assigned to a stage-matched condition were compared with those assigned to a stage-mismatched condition on all three outcome measures. Table 2 shows that the sizes of three of the four matched groups were rather small for tests using binary outcome variables. Therefore, the analyses of smokers with low readiness to quit (immotives and precontemplators) were combined. That is, matched smokers (immotives in the OC condition and precontemplators in the BO condition) were compared with mismatched smokers (immotives in the BO and SE conditions and precontemplators in the OC and SE conditions). A binary match–mismatch variable was computed and entered in regression analyses for each of the three outcome measures. The same was done for smokers with high readiness to quit. That is, contemplators in the BO condition and preparers in the SE condition (matched) were compared with contemplators in the OC and SE conditions and preparers in the OC and BO conditions (mismatched). The match–mismatch tests showed the following results.

In smokers with low readiness to quit, the percentage of smokers who made a forward stage transition among those who received stage-matched information did not differ significantly from that among those who received mismatched information (32.9% vs. 31.9%). Furthermore, nonsignificant differences were found with regard to 7-day cessation (2.9% vs. 4.1%) and intention to quit (5.10 vs. 4.94).

In smokers with high readiness to quit, the percentage stage transition among those who received stage-matched information was borderline significantly ($p < .10$) higher than it was among those who received mismatched information (44.8% vs. 34.7%). With regard to 7-day cessation, matched smokers had quit borderline significantly more often than had mismatched smokers (17.8% vs. 10.3%). Intention to quit did not differ significantly between smokers who were and were not matched (7.80 vs. 7.99).

Post Hoc Analyses

The first set of post hoc analyses concerned the distinction between immotives and precontemplators. Because the match–mismatch tests in smokers with low readiness to quit were nonsignificant, it might be argued that the present distinction between immotive and precontemplating smokers was not justified in the first place. Therefore, post hoc analyses were computed in which immotive and precontemplating smokers were pooled in one group of smokers who were not planning to quit within the next 6 months. In contrast analyses, we tested whether this group as a whole benefited more from one experimental condition than from another. Furthermore, three possible match–mismatch analyses were computed on the data from this pooled group: (a) considering the OC condition to be matched and both other conditions mismatched, (b) considering the BO condition to be matched and both other conditions mismatched, and (c) considering the SE condition to be matched and both other conditions mismatched. None of the contrast analyses and none of the match–mismatch analyses revealed significant effects with regard to stage transition, 7-day cessation, and intention to quit. Hence, compared with the pooled group, the data neither refuted nor justified the distinction between immotives and precontemplators.

A second set of post hoc analyses concerned the data on backward stage transition (see Table 4). This was performed because positive effects of the interventions might have been neutralized by backward stage transition. In immotives, no backward transition was possible. Furthermore, of all possible contrasts between the four conditions, only among contemplators did the three experimental conditions lead to significantly fewer backward transitions than the control group. The match–mismatch analyses, hypothesizing that fewer matched smokers than

Table 4
Stage Transition and Point Prevalence Abstinence (7-Day Cessation) at T3 by Stage and Condition: Percentages and Odds Ratios

Stage transition and days of cessation	OC %	OC vs. CO odds ratio	SE %	SE vs. CO odds ratio	BO %	BO vs. CO odds ratio	CO %
Stage transition							
Overall sample							
Forward	31.2	1.89**	36.5	2.42***	35.6	2.34***	19.1
Backward	11.5		10.2		8.4		17.4
Immotives							
Forward	32.0	2.11*	27.5	1.85	30.6	2.09*	17.4
Precontemplators							
Forward	28.8	1.90	40.7	3.23**	34.5	2.50*	17.1
Backward	5.5		4.9		1.7		15.7
Contemplators							
Forward	29.0	1.71	32.2	1.91	39.3	2.64*	20.0
Backward	14.5		18.6		16.4		28.9
Preparers							
Forward	37.8	1.70	54.3	3.49*	45.9	2.60	25.7
Backward	48.6		31.4		30.6		48.6
Seven days of cessation							
Overall sample	4.8	1.52	8.5	2.91*	8.1	2.71*	3.2
Immotives	1.9	—	1.2	—	3.4	—	1.1
Precontemplators	5.3	2.03	7.0	2.73	4.8	—	2.7
Contemplators	6.9	1.84	8.2	2.11	10.9	2.94	3.9
Preparers	7.7	—	29.7[a]	5.00*	22.0	2.81	8.3

Note. Odds ratios with $p > .5$ are not depicted. A significant odds ratio greater than 1.00 means that the percentage in the experimental condition was significantly higher than the percentage in the control condition (last column). The odds ratios (but not the percentages) are adjusted for sex, age, and education. T3 = Time 3 (10 weeks after intervention); OC = outcome information; SE = self-efficacy information; BO = both sorts of information; CO = no information.
[a] Contrast analyses between the three experimental conditions were computed within each stage: Only preparers in the SE condition had quit smoking for 7 days significantly more often than did preparers in the OC condition.
* $p < .05$. ** $p < .01$. *** $p < .001$.

mismatched smokers would make a backward transition, revealed no differences.

Manipulation Check and Reading the Letter

It was expected that (a) an intervention containing outcome information would cause an increase in expected positive outcomes, (b) an intervention containing self-efficacy-enhancing information would cause an increase in self-efficacy, and (c) both sorts of information would cause a decrease in the expected negative outcomes (Dijkstra et al., in press). Table 5 shows the means of all four cognitive measures per condition. Participants who had refrained from smoking for a week were excluded from the analyses, leaving 1,032 participants: 393 immotives, 284 precontemplators, 229 contemplators, and 126 preparers. Receiving outcome information only (OC condition) as well as both outcome and self-efficacy-enhancing information (BO condition) led to the anticipation of more pros than did receiving no information (CO condition). A contrast analysis revealed that receiving outcome information only led to the anticipation of significantly more pros than did receiving the combination of information. Receiving self-efficacy-enhancing information only (SE condition) led to an increase in self-efficacy to cope with social situations. No significant effects were found with regard to the cons of quitting and self-efficacy in coping with emotions. Concerning the extent to which smokers reported having read the tailored letter, there were no effects of stage or condition. The mean scores, on a 10-point scale, all ranged from 9.27 to 9.85.

Analyses Including Dropouts

Because attrition at T3 could be predicted by condition, sex, and stage at T1, the present results might have been influenced by selective dropout. One way to study this problem is to use the last known measurement (T1 or T2) of each dropout as a substitute for the T3 measurement and repeat all analyses (Heyting, Tolboom, & Essers, 1992). At T3, data were missing from 440 participants who had dropped out. Of these missing participants, 145 were replaced by T2 data and 295 by T1 data. With regard to the 7-day smoking cessation outcome measure, all dropouts were considered to have smoked for the last 7 days. In these analyses, none of the significant results changed qualitatively. Only minor changes in betas, odds ratios, and p values emerged.

Discussion

The first goal of this study was to assess what sort of information smokers in each stage have to be offered in smoking cessa-

Table 5
Manipulation Check: Means and Raw Betas of Four Cognitive Variables at T3 by Condition, Adjusted for Pretest Score, Sex, Age, and Education

Variable (scale range)	OC (n = 281) M	OC vs. CO β	SE (n = 249) M	SE vs. CO β	BO (n = 261) M	BO vs. CO β	CO (n = 243) M
Pros of quitting (0–3)	1.72	0.16***	1.58	0.02	1.64	0.08*	1.56
Cons of quitting (0–3)	1.19	−0.01	1.20	0.01	1.22	0.03	1.19
Self-efficacy in social situations (−3 to 3)	0.00	0.14	0.06	0.19*	−0.05	0.09	−0.013
Emotional self-efficacy (−3 to 3)	−0.74	0.16	−0.77	0.13	−0.81	0.08	−0.89

Note. Participants who at T3 stated that they had refrained from smoking for 7 days were excluded from these analyses. Condition was dummy-coded. A positive beta indicates that the mean score in the experimental group exceeds that of the control group. T3 = Time 3 (10 weeks after intervention); OC = outcome information; SE = self-efficacy-enhancing information; BO = both sorts of information; CO = no information.
* $p < .05$. ** $p < .01$. *** $p < .001$.

tion interventions. A test of mainly practical value was to compare each of the three experimental conditions with the no-information CO condition. Considering stage transition the outcome measure that was appropriate to all stages, the following results were obtained. In immotives, both conditions that presented outcome information led to more transitions than did the CO condition. In precontemplators, both conditions that presented self-efficacy-enhancing information led to more transitions than did the CO. In contemplators, the condition presenting both types of information led to more transitions than did the CO condition, and in preparers, the condition that presented self-efficacy-enhancing information only led to more transitions than did the CO. The hypotheses regarding contemplators and preparers were verified, but in immotives and precontemplators this was only partly the case. Moreover, none of the contrasts among the experimental groups with regard to stage transition were significant. Hence, these results permit only preliminary recommendations for interventions directed at each stage. Practically, two interventions seem to be needed: one intervention containing outcome information and self-efficacy-enhancing information to be directed at immotives, precontemplators, and contemplators and one intervention containing self-efficacy-enhancing information only, directed at preparers.

The second goal of this study was to assess whether the principle of stage-matched information could be demonstrated. The match–mismatch tests revealed that smokers with high readiness to quit who were assigned to the matched treatment made borderline significantly more stage transitions and stopped smoking for a week borderline significantly more often than did smokers who were assigned to a mismatched treatment. In addition, the contrast analyses revealed that (a) contemplators in the condition that offered both types of information had greater intention to quit than did those in the condition that offered self-efficacy-enhancing information only and (b) preparers in the condition that offered self-efficacy-enhancing information only stopped smoking for a week more often than did those in the condition that offered outcome information only. Together, the results of the comparisons with the no-information CO group, the results from the contrast analyses, and those from the match–mismatch analyses strongly indicate that contemplators need a combination of outcome information and self-efficacy-enhancing information and preparers need self-efficacy-enhancing information only. Taken together with earlier research showing that the effectiveness of smoking cessation interventions is lower for smokers in the contemplation stage than for smokers in the preparation stage (DiClemente et al., 1991; Prochaska, 1991), these findings strongly support the distinction between two stages of high readiness to quit.

Concerning smokers with low readiness to quit, the results were partly unexpected. Smokers who were assigned to a matched treatment did not benefit more from treatment than did smokers who were assigned to a mismatched treatment. This could mean that it does not really matter what kind of information smokers with low readiness are offered, as long as they are offered information on smoking and smoking cessation. Especially in immotives, the conditions led to only small differences in the percentages of smokers who made forward stage transitions: Whereas the largest difference between the three experimental conditions was 4.5% in immotives, it was 11.9% in precontemplators, 10.3% in contemplators, and 16.5% in preparers. In precontemplators, the data on intention to quit showed that all three experimental conditions led to a significant increase compared with the CO condition. These data on stage transition among immotives and intention to quit among precontemplators seem to support the notion that none of the types of information used in the present study were specifically matched or mismatched to smokers with low readiness to quit.

The following explanations might be considered. First, the lack of matched or mismatched information could be related to the existence of smoker subtypes (Velicer, Hughes, Fava, Prochaska, & DiClemente, 1995). For example, some smokers with low readiness to quit, including those in the groups of immotives and precontemplators, might benefit more from outcome information, whereas others might benefit more from self-efficacy-enhancing information. Second, it may be that the present information conditions did not manipulate matched or mismatched information that was relevant to smokers with low readiness to quit. For example, it might be that for these smokers variables such as framing of the information or the length of the intervention messages can be matched or mismatched. Third, it might be that in smokers with low readiness to quit, messages on smoking and smoking cessation do not change the targeted

cognitions because smokers at this stage process little information on smoking and smoking cessation (DiClemente et al., 1991; Prochaska et al., 1992; Prochaska, Velicer, DiClemente, & Fava, 1988). That the tailored interventions did, however, lead to more changes than did no intervention might be understood by regarding the tailored interventions as a cue to action. Although these explanations may be plausible, the present findings did not support the hypothesized matching for immotives and precontemplators. In that respect, smokers in contemplation and preparation stages differ from smokers with low readiness to quit, thereby supporting the distinction between smokers with high readiness to quit and those with low readiness to quit.

The data revealed some additional relevant results. For example, the results obtained with stage transition, the primary outcome measure, were supported by the more conventional outcome measures: Intention to quit revealed about the same pattern of effects in immotives, precontemplators, and contemplators, and the 7-day cessation measure revealed the same pattern in preparers. In fact, the stage transition outcome measure combined both conventional outcome measures: The early stages were defined in terms similar to a measure of intention, whereas the later stage (the action stage) was defined in terms of behavior.

The effects of the tailored intervention are considered to be mediated by changes in cognitions, that is, expected outcomes and self-efficacy expectations. The basic condition for these cognitive changes seems to have been met: In all three experimental conditions, smokers in the four stages reported having read the letter thoroughly—the average scores on a 10-point scale were all above 9. This high figure might be explained by the personal relevance of the tailored letters: Smokers saw their own name and recognized their smoking behavior and psychological profile in the intervention.

The expected changes in cognitions could partly be detected. Receiving information only on the outcomes of smoking cessation led to the anticipation of more pros of quitting, whereas receiving only self-efficacy-enhancing information led to more confidence in the ability to cope with social situations. Receiving both types of information at the same time resulted in the anticipation of more pros of quitting. The effects were small, and the anticipation of the cons of quitting and perceived self-efficacy in coping with emotions was not significantly changed by the interventions. However, the results regarding cognitive changes might be underestimated by the exclusion of the 7-day quitters from these analyses. It is promising that despite this exclusion, five to seven pages of individualized information were able to change relevant cognitions after 10 weeks.

One limitation of the present study is the short follow-up. It is possible that changes in smokers in different stages need more time to develop. In addition, we do not know to what extent the results were influenced by selective dropout of participants, although the intention-to-treat analyses suggest that the influence difference was small. Furthermore, the sample is selective: Immotives and precontemplators with probably relatively little psychological defense for the confrontation with their smoking behavior joined the study. On the other hand, it seems an appropriate sample to draw conclusions from, since future applications of tailored information may well be directed at these kinds of smokers.

In future research, the present stage-matched results need to be replicated, and the group of smokers with low readiness to quit should be especially addressed. There is a need for further mapping of this population of smokers. Furthermore, different match–mismatch manipulations could be developed for this group. That smokers with low readiness to quit comprise a significant proportion of the smoking population, both in The Netherlands (70%; Mudde et al., 1994) and in the United States (40%; Velicer et al., 1995), justifies continued efforts to target this group.

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