

Facilitating Autonomous Motivation for Smoking Cessation

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Physicians used either an autonomy-supportive or a controlling interpersonal style to counsel smokers based on National Cancer Institute guidelines. Physician autonomy support was rated from audiotapes, and patients' perceived competence and autonomous motivation for quitting were self-reported on questionnaires. Validated point prevalences for 6, 12, and 30 months and for continuous cessation were examined. The intervention did not have a direct effect on quit rates; however, structural equation modeling supported the self-determination process model of smoking cessation. The model indicated that the autonomy-supportive intervention was rated as more autonomy supportive, that rated autonomy support predicted autonomous motivation, and that autonomous motivation predicted cessation at all points in time. Perceived competence contributed independent variance to cessation only at 6 months.

Key words: smoking cessation, autonomous motivation, physician autonomy support, self-determination theory

Tobacco use is the largest avoidable cause of illness and death in the United States, responsible for about one in five of all American deaths annually (McGinnis & Foege, 1993). When people stop smoking permanently, even after years of smoking, the health risks are immediately reduced and continue to decrease in the subsequent years of abstinence (U.S. Department of Health and Human Services [US DHHS], 1990).

The 1990 Surgeon General's report provided strong evidence that smoking cessation interventions greatly reduce smokers' risk of suffering from smoking-related disease (US DHHS, 1990). Although the percentage of people who stop smoking permanently following various interventions is small, typically in the 5% to 20% range, the benefits in terms of reduced disease and medical costs are so great for each quitter that the Surgeon General strongly endorsed cessation programs. Even very brief interventions (about 3 min) by physicians during routine office visits have been shown to be effective in increasing quit rates (Fiore et al., 1996).

Because about 25% of Americans smoke regularly, and half of all long-term smokers die from smoking-related diseases, the Agency for Health Care Policy and Research (AHCPR) has em-

phasized that physicians should systematically counsel their patients who smoke to quit, using a model originally proposed by the National Cancer Institute (NCI), referred to as the 4-As: *ask* about smoking, *advise* to quit, *assist* by negotiating a quit date, and *arrange* follow-up (Fiore et al., 1996). In a series of studies funded by the NCI (Glynn, Manley, & Pechacek, 1990), physicians were trained to use the 4-As model, resulting in quit rates among their smoking patients that were significantly higher than usual care. The present study, informed by self-determination theory (SDT; Deci & Ryan, 1985; Williams, Deci, & Ryan, 1998; Williams, Quill, Deci, & Ryan, 1991), examined whether the style used by physicians in administering the 4-As intervention would affect smokers' motivation to quit.

SDT

SDT distinguishes between autonomous and controlled behavioral regulation. Behaviors are autonomous to the extent that people experience a true sense of volition and choice and act because of the personal importance of the behavior. In contrast, behaviors are controlled to the extent that people feel pressured to perform them, either by external or intrapsychic forces. The practical importance of this distinction is that autonomous motivation, relative to controlled motivation, is expected to facilitate smokers' quitting smoking, resisting relapse, and maintaining the decrease in smoking, resulting in important health benefits (US DHHS, 1990). According to SDT, behavioral regulation becomes more autonomous when the regulation is fully internalized, whereas it is relatively controlled if the regulation remains external (e.g., behaving to please one's doctor) or is only partially internalized (e.g., being controlled by anxiety or guilt). In SDT, fully internalized regulation is said to be integrated, whereas partially internalized regulation is said to be introjected (see, e.g., Deci & Ryan, 1985, 1991).

Autonomous regulation is assessed with the Treatment Self-Regulation Questionnaire (TSRQ). Previous research using the TSRQ found autonomous regulation to be positively associated

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with active participation in an alcohol treatment program (Ryan, Plant, & O'Mally, 1995), long-term maintenance of weight loss and exercise in patients who were initially morbidly obese (Williams, Grow, Freedman, Ryan, & Deci, 1996), reduction in intensity and frequency of smoking in adolescents (Williams, Cox, Kouides, & Deci, 1999), adherence to long-term medicine regimens in adult outpatients (Williams, Rodin, Ryan, Grolnick, & Deci, 1998), and better glucose control in patients with diabetes (Williams, Freedman, & Deci, 1998).

Perceived competence concerns the extent to which people feel they can achieve a goal, the relevant goal in this case being smoking cessation. Perceived competence is measured with the Perceived Competence Scale (PCS) for smoking cessation. Past research, based on SDT, revealed that people felt greater competence when they were autonomously motivated, and that autonomous motivation and perceived competence predicted maintained behavior change (e.g., Williams & Deci, 1996; Williams, Freedman, & Deci, 1998). In the present study, we hypothesized that autonomous motivation and perceived competence for smoking cessation would predict maintained abstinence.

Autonomy Support

Part of the importance of demonstrating that these motivational factors predict long-term smoking cessation is that SDT specifies interpersonal factors, summarized by the concept of *autonomy support*, that facilitate autonomous regulation and, in turn, perceived competence. Research has shown, for example, that when significant others, such as health care providers, support individuals' autonomy (e.g., by offering choice, minimizing controls, or acknowledging feelings), the individuals develop more autonomous self-regulation (Deci, Eghrari, Patrick, & Leone, 1994; Williams & Deci, 1996; Williams, Freedman, & Deci, 1998), and that the enhanced autonomous regulation also yields greater feelings of competence (e.g., Williams & Deci, 1996; Williams, Freedman, & Deci, 1998).

In the present study, we expected greater autonomy support to lead to greater autonomous motivation for smoking cessation and that autonomous motivation would enhance perceived competence for smoking cessation (from before to after the interview with the physician). In most previous studies of the relation between autonomy support and autonomous motivation (e.g., Williams et al., 1996; Williams, Rodin, et al., 1998), autonomy support was measured with the Health Care Climate Questionnaire (HCCQ) as a self-report of patients' perceptions of their providers. The present study differs from those previous ones in two ways. First, we introduced an experimental intervention intended to have physicians be more supportive of autonomy for some patients and less so for others; second, rather than having patients complete the HCCQ to report their perceptions of their doctors' autonomy support, we used the HCCQ items but had trained observers rate the physicians' autonomy support after listening to audiotapes of the counseling sessions.

In two studies of motivation for not smoking among high school students (Williams et al., 1999), an intervention was given in the form of group lectures on smoking cessation. In each, some students were given a lecture by a physician using a style that was high in autonomy support and others got the lecture in a style that was low in autonomy support (i.e., was more controlling). Results

of both studies indicated that those who got the autonomy-supportive lecture perceived it as more autonomy supportive and in turn reported more autonomous motivation for not smoking. The second study, which was a 4-month longitudinal study, also revealed, as predicted, that greater perceived autonomy support led to (a) an increase in students' autonomous motivation for not smoking over the 4-month period and (b) a reduction in actual smoking behavior. However, the experimental conditions (i.e., the actual style used) did not directly predict smoking behavior.

Finally, a study of self-help smoking cessation programs provided evidence that programs designed to stimulate autonomous motivation were more effective in promoting smoking cessation than those designed to initiate controlled motivation (Curry, Wagner, & Grothaus, 1991).

Autonomy Support and Motivational Interviewing

The concept of being autonomy supportive in a clinical encounter, which is a central concept of SDT and is theorized to promote autonomous motivation for behavior change, bears considerable similarity to what is advocated in the technique of *motivational interviewing* (Miller & Rollnick, 1991). Motivational interviewing involves providers using a patient-centered style in an attempt to encourage patients to become more responsible for their own health-relevant behavior. The primary difference between motivational interviewing and SDT is that the former is a technique, whereas the latter is a theory. Thus, although a clinician using the two approaches might behave quite similarly, motivational interviewing does not provide a process model that describes how a patient-centered style would bring about greater cessation, whereas SDT, which began as a theory of motivation and was then applied to the problem of changing health-relevant behaviors, is very much concerned with the psychological processes through which behavior change is promoted and maintained.

The present experiment was designed to explore more extensively the effects of autonomy support versus control on the smoking of adult outpatients, first by examining whether the use of an autonomy-supportive versus controlling style of administering the 4-As intervention would differentially affect smoking cessation and second by testing the self-determination model for smoking cessation and its maintenance with adults who were individually counseled by physicians to stop smoking. The model incorporated the following hypotheses: that the smoking-cessation intervention, administered with an autonomy-supportive style would lead to higher ratings of autonomy support than the intervention administered with a controlling style; that ratings of autonomy supportiveness of the provider would predict autonomous motivation for quitting; that autonomous motivation would then predict perceived competence; and that both autonomous motivation and perceived competence would predict continuous abstinence at 6, 12, and 30 months. Figure 1 depicts this model.

Method

Overview

Twenty-seven primary care physicians administered the 4-As model using an autonomy-supportive style with half their nicotine-dependent patients who agreed to be in the study and a controlling style with the other half. Participants had one brief counseling session, which was tape re-

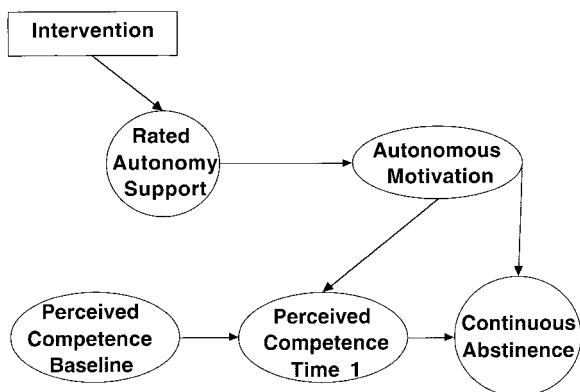


Figure 1. Hypothesized self-determination model of smoking cessation.

corded. In addition, if they agreed in that meeting to set a quit date, they were asked by the physician to schedule a follow-up visit within 2 weeks after their scheduled quit date. The second visit, for those who had it, was not tape recorded. Prior to the initial session, participants completed a questionnaire concerning demographics and smoking behavior, and they also completed the PCS for smoking cessation. Following the counseling session, they were given another questionnaire containing the TSRQ for assessing autonomous motivation and a second administration of the PCS, which they completed at home and returned by mail. Trained observers listened to the audiotapes and rated the physician's style (using HCCQ items) for the degree to which it was autonomy supportive. Participants then reported at 6, 12, and 30 months whether they were smoking. All participants who reported at 6 months that they had quit had a carbon monoxide (CO) test to validate the self-report. Those who reported not smoking at 12 months were validated if they had not been validated at 6 months. We assumed that nonsmokers at both 6 and 12 months who had passed the validation at 6 months could be relied on to provide valid reports at 12 months. Because so much time had passed by the 30-month follow-up, all participants who reported not smoking at 30 months were validated with CO levels.

Participants

A total of 336 individuals agreed to participate in the study and completed the initial questionnaire; 316 actually attended the doctor visit where they were randomized to condition; 301 had usable audiotapes of the visits; 244 completed the postvisit questionnaire; and 239 were available at the time of the 6-month outcome assessment. Analyses testing the effects of the provider style on cessation rates and those testing the process model were all done on the 239 participants with complete data to have the same participants in both sets of analyses. The primary outcome variable for testing the model was continuous abstinence at 6, 12, and 30 months, and the full sample of 239 patients was used in all these analyses. However, only 210 were available to provide actual smoking-status data at 12 months, and only 189 were available to provide actual smoking-status data at 30 months. Thus, we classified people who did not provide cessation data at 12 and 30 months as smokers so we could include them in all the analyses. There were 29 so classified as smokers at 12 months and 50 so classified at 30 months. In contrast, people who did not provide cessation data at 6 months were excluded from the analyses. The reason for this was as follows. Complete data are required to do structural equation modeling (SEM) analyses; so we selected the 239 with complete 6-month data to test the process model, and, as just described, we imputed missing data at 12 and 30 months for those patients. Then, to have the people in the analyses that tested the direct effects of physician style be the same as those in the analyses testing the process model, we used the same sample of 239

patients. This approach is consistent with the latest Public Health Service (PHS) guidelines for smoking cessation research (Fiore et al., 2000, p. 14).

Two points are worth noting concerning the selection of sample. First, the rates of responding at the two follow-ups were not affected by condition. For the 239 with complete data, 116 (49%) were in the autonomy-supportive condition. Of the 210 who provided actual data at 12 months, 100 (48%) were in the autonomy-supportive condition, and of the 189 who provided actual data at 30 months, 92 (49%) were in the autonomy-supportive condition. Second, because the between-groups test of the direct effect of physician style did not yield a significant difference, and because the rates at which participants provided data did not differ by condition, the results of the direct test of physician style would not have been different if we had included participants who did not provide actual cessation data at 6 months and classified them as smokers.

Participants were recruited in doctors' offices and medical buildings by signs and through newspaper advertisements. Entry criteria included smoking at least five cigarettes a day and being willing to "discuss their smoking with a doctor, so we can learn more about how doctors can better counsel their patients who smoke." Participants were informed that their doctor visit would be audiotaped and that they would be asked to complete questionnaires at four times. Individuals were encouraged to participate "whether they wanted to quit or not, because physicians need to talk with patients who want to quit and with those who do not." Patients were given a \$5 honorarium after each questionnaire (total \$20) and a \$10 honorarium for each breath test taken, and they were provided free parking passes. They were sent a debriefing letter at the end of the study describing the hypotheses and results.

The Interveners

Twenty-seven physicians implemented the intervention by counseling patients about smoking cessation using the NCI's 4-As model for smoking cessation. To recruit interveners, Geoffrey C. Williams explained the study to 56 area physicians at a series of small-group meetings and asked if they would like to participate. Thirty-five physicians said they would participate and attended a 3-hour training session, although only 27 of them actually enrolled patients. The training was conducted by an NCI-trained trainer, at which the physicians were taught the 4-As model and were taught how to implement it with two different styles—an autonomy supportive style and a controlling style. As part of this training, the physicians role played each style and were given feedback. They were not informed of the study hypotheses nor of the criteria by which the audiotapes would be rated, and they were asked not to disclose their use of the two different intervention styles to their patients. The doctors received a \$50 honorarium for their participation, regardless of the number of patients they counseled.

Participating physicians served as recruiters by having signs in their offices and by mentioning the study to patients who smoked. There were also other signs and advertisements with a phone number to call. If the primary-care doctor of an individual who agreed to participate in the study was one of the 27 participating physicians, the participant was counseled by his or her own doctor. If not, the participant was assigned to a participating physician who did the counseling without reimbursement. Sixty-one percent of the patients saw their own doctor and 39% were assigned a doctor, and the percentages did not differ by condition.

We do not have accurate data about the number of people who spoke to a study staff member about participating but did not participate. Thus, it is unclear how many people were approached to obtain the 336 participants, but we estimate that between 300 and 400 smokers either declined a doctor's invitation to participate or made an initial phone call to inquire about the study but did not participate.

The design of the study called for each physician to use the two interpersonal styles in administering the 4-As intervention. It is likely that, on average, the physicians differed from each other in the degree to which they were autonomy supportive, but the randomization procedure ensured

that each physician counseled essentially the same number of patients with each style, so the effects of physicians' individual styles would have been constant across intervention conditions. Further, ratings of the autonomy supportiveness of the physicians in the two different conditions allowed us to determine that there was a significant difference in the average autonomy supportiveness in the two conditions that were intended to be different.

The Intervention

The 4-As model was designed so it could be implemented in a period as brief as about 3 min, with the recommendation that physicians use the model every time they see a patient who smokes. The model can also be used for longer counseling sessions. In this study, the average counseling period was 11 min long, with most lasting between 8 and 12 min. The 4-As model suggests that physicians should begin by *asking* about the patients' smoking behavior. In the present study, this included eliciting the patients' smoking histories, including whether they had tried to quit before and what had happened if they had. Next, physicians should *advise* the patients to quit because of the health risks associated with smoking and should *assist* them in quitting by encouraging them to set a quit date within the subsequent 4 weeks by providing written material and by recommending that the patients use nicotine replacement therapy if there are no contraindications and if they smoke at least 10 cigarettes per day. Finally, the model indicates that physicians should *arrange* a follow-up visit or phone call within 2 weeks after the agreed-upon quit date to discuss what happened. In the present study, the model was used for all patients, but the style in which it was used took two forms: autonomy supportive and controlling.

Autonomy-supportive style. The central features of autonomy support are for the physicians to see the situation from the patients' perspective and to encourage the patients to make their own choices. When relating in this way, physicians should provide information that is relevant to patients' health, but should not attempt to impose their own perspective on the patients or to make the patients change. This would include respecting that the patients do not want to stop smoking if that is what they say.

When advising patients to stop smoking in an autonomy-supportive way, physicians might say something like, "As your physician, I believe quitting smoking is the most important thing you can do for your health, but the decision really is yours to make." In this statement, the advice is intended as information rather than as direct external pressure to change. When giving advice in this way, physicians would also typically ask how the patients feel about the advice. Because, in the autonomy-supportive condition, the physicians took the patients' perspective and emphasized choice, they did not pressure the patients to set a quit date if the patients had said they were not ready to quit. Instead, they might discuss what would need to happen for the patients to be ready to attempt to quit. If the patients indicated a readiness to quit, the physicians would negotiate a quit date in the next 4 weeks, and they would emphasize that the patients had a choice about the use of medications.

Controlling style. In the controlling condition, the physicians directed the patients to quit, without eliciting the patients' perspectives. Thus, when asking about smoking, they gathered information in a typical manner but did not ask the patients what they liked about smoking, and they listed health problems caused by smoking rather than eliciting the patients' concerns about it. Similarly, the advice statement indicated that the patient "should stop now" for the health reasons the doctors enumerated. The assist aspect involved directing all patients to set a quit date within 4 weeks, to read the written material, and, for all patients who smoked at least 10 cigarettes per day and had no contraindications, to use the nicotine-replacement medication. Participants were also instructed to set up a follow-up contact within 2 weeks after their quit dates.

Randomization to Conditions

Just prior to a participant's meeting with a physician, the physician opened a sealed packet that contained a blank audiotape and a brief

instruction sheet that indicated which style to use and had a short outline of the key points of the 4-As model when used in that style. The physicians were encouraged to use the instruction sheet during their visit if needed.

Questionnaires

The baseline questionnaire completed by participants before meeting with their physicians included age, gender, marital status, race, household income (on a 9-point scale), education level (on a 6-point, quasi-continuous scale), number of previous serious quit attempts, number of cigarettes smoked per day, number of pack years (the average number of packs of cigarettes the person smokes each day \times the number of years he or she has smoked), the Fagerstrom (1978) addiction-severity scale, and the PCS.

Following the meeting with a physician, participants were given a second questionnaire packet, which they were asked to complete at home and return by mail within 1 week. This packet included the TSRQ and PCS.

Treatment self-regulation questionnaire. The TSRQ has five items that assess autonomous motivation. It asks participants why they would try to stop smoking and gives five possible reasons, answered on 7-point Likert-type scales. Their autonomous motivation score was the sum of their responses on the five items. An example is, "I've carefully thought about quitting and believe it's the right thing for me to do."

Perceived competence scale. The PCS has 4 items, answered on 7-point Likert-type scales, that concern the degree to which participants feel confident about their ability to stop smoking. Their PCS was the sum of the four item scores. An example is, "I feel confident about my ability to quit smoking for good."

Tape Ratings

Each initial physician visit was audiotaped, and three trained raters (all psychology graduate students who were naive to the design and hypotheses of the study) listened to the portion of the tape that contained the smoking-cessation counseling session to rate the autonomy supportiveness of the physician.

The raters had had 15 hr of training, during which they discussed the concepts of autonomy support versus control and listened to audiotapes of physician-patient interactions. They rated several tapes, discussing the reasons for their ratings after each tape, until it was clear that they had a shared understanding of the concepts.

Physicians' autonomy supportiveness was determined by having raters respond to the five items (7-point Likert-type scales) on the short form of the Health Care Climate Questionnaire (Williams et al., 1996; Williams, Freedman, & Deci, 1998). The initial questionnaire was designed for patients to rate the autonomy supportiveness of the physician, but the items from it have also been used by observers when rating the autonomy supportiveness of a provider (e.g., Williams & Deci, 1996). There is a long form (15 items) of the questionnaire and the rating scale, and a short form (5 items) derived as being representative of the concept and then validated against the longer form. In this study, the five items on the short form were intended to be used as indicators in SEM analyses. The items concerned whether the physician tended to encourage the patient's questions and initiations, provide choices, understand the patient's perspective, and convey confidence in the patient's ability to stop smoking. To determine interrater reliability, the scale items were summed, and the Cronbach's alpha across the three raters was calculated. The alpha of 0.81 for rated autonomy support was considered acceptable. In the analyses, we used the average score for each item, created by averaging each item score across the three raters.

Outcome Variables

Point prevalences for smoking cessation were determined at 6, 12, and 30 months by asking, "Have you smoked a cigarette, even a puff, in the

past seven days?" All patients who answered no at 6 and 30 months were given a CO breath test. Those who reported not smoking at 12 months were also validated with the CO test if they had not been validated at 6 months. The reports at 12 months of those who had been validated at 6 months were assumed to be valid. Two additional outcome indicators were recorded at 6, 12, and 30 months: "What was the date of the last cigarette you smoked?" and "What is the longest number of consecutive days you were off cigarettes during the period since your appointment with the doctor at the start of this study?" If patients were unavailable at the 12- or 30-month follow-ups, they were considered smokers. They were, therefore, assumed to have had no days since their most recent cigarette and were considered to have had no days free from smoking since the previous assessment. Thus, their previously reported longest number of days was used. The resulting variables are referred to as *days since last cigarette* and *longest number of days not smoking*, respectively. Finally, each of the three outcome variables was created for continuous abstinence. A patient would be considered a continuous nonsmoker only if he or she was not smoking by point prevalence at each of the three assessment points.

Analyses

SEM was planned to test the self-determination model shown in Figure 1. SEM done with the structural equation modeling software EQS (Version 5.7a) offers two primary advantages over more conventional approaches such as mediational analyses using multiple regression. First, EQS tests the overall goodness of fit of a full theoretical model, which mediational analyses using multiple regression are unable to do. Given the current model, with multiple hypothesized mediating variables, conventional mediational analyses could not evaluate the multiple mediators simultaneously. The use of SEM, on the other hand, allowed us to test the overall fit of the full theoretical model presented in Figure 1. Second, because regression analyses assume that scales perfectly measure the underlying concepts, there is always unreliability because of measurement error. Using multiple indicators, SEM creates latent variables, which are free of random measurement error because all variability in the indicator variables that is not associated with the latent variables is excluded as error variance, thus making the test more powerful.

We used the following approach for creating latent variables. The latent variable *rated autonomy support* was constructed by averaging each of the five-item scores across the three raters and then using the five-item averages as indicators. The *autonomous motivation* (five items) and *perceived competence* (four items) latent variables were constructed using the questionnaire items as indicators. Because perceived competence was measured twice (before and after the physician visit), the errors were allowed to correlate in the model. The latent variable of *not smoking* was formed from three indicators: (a) the point prevalence at one of the three assessment points, or at all three for *continuous abstinence*; (b) the number of days since last cigarette used to correspond to the timing of the point prevalence; (c) and the longest number of days reported not smoking since the intervention visit. We used these three indicators, rather than just cessation, for two reasons: first, because use of multiple indicators is preferable for testing a process model, and second, because the three variables were very highly related so they do all seem to be indicators of cessation. Indeed, the SEM analyses confirmed that the lambda coefficients between the latent variable and each of the three indicators was very high and of comparable magnitude (0.92 for longest number of days not smoking, 0.95 for days since last cigarette, and 0.90 for validated point prevalence). The direct effect of physician style was done just on validated cessation because point prevalence is the literature standard for smoking cessation. In testing the final process model, we used variables as predictors of the *not smoking* outcome only if they were significantly related to cessation point prevalence at 6, 12, and 30 months and to continuous abstinence. No demographic variables were added to the model because none correlated significantly with point prevalence.

In SEM analyses using EQS Version 5.7a, one begins by assessing the relation between latent variables and their indicators. To do this, we performed confirmatory factor analyses. Then, one tests hypotheses about the relations among the latent variables (Anderson & Gerbing, 1988). Maximum likelihood estimation with robust correction for nonnormality was used to generate the standardized parameter estimates (Satorra & Bentler, 1988a, 1988b, 1994). To determine the fit of the models to the observed data, we used the robust chi-square statistic (Satorra & Bentler, 1994), the nonnormed fit index (NNFI; Tucker & Lewis, 1973), the robust comparative fit index (CFI; Bentler, 1989, 1990), and the root mean square error of approximation (RMSEA; Steiger, 1990). A chi-square that is not significant ($p > .05$) indicates a good fit because the model does not differ significantly from the data (Bollen, 1989). An NNFI and robust CFI with a value above .90 indicates a good fit, an RMSEA of 0.05 to 0.08 indicates a very good fit, and an RMSEA of less than 0.05 represents an excellent fit (Browne & Cudeck, 1993).

Results

Completers Versus Noncompleters

Of the 336 smoking patients who completed the previsit questionnaire, 239 (71%) also attended the tape-recorded doctor visit, completed the postvisit questionnaire, and were available for the 6-month smoking-status assessment. Table 1 shows descriptive statistics for the data obtained from the first questionnaire for the sample of 239 used in the primary analyses. Of note, participants smoked an average of 22 cigarettes per day and had an average of 29 pack years smoked. Comparisons on all variables between the 239 completers and the 97 noncompleters were made by *t* tests for continuous variables and by chi-square tests for percentages. Of the 12 variables on the previsit questionnaire (viz., the first 12 variables listed in Table 1), which included the demographics, nicotine-dependence variables, and initial perceived competence for cessation, there were only two significant differences between completers and noncompleters. Noncompleters were younger than completers (mean ages were 37.8 and 43.2, respectively), and

Table 1
Means and Standard Deviations or Percentages for Demographic, Nicotine-Dependence, and Motivation Variables (N = 239)

Variable	M	SD
Age (years)	43.18	11.97
Gender (% female)	63	
Married or living together (%)	56	
Race (% non-White)	19	
Income (1–9)	5.29	2.30
Education (1–6)	3.78	1.18
Previous quit attempts	3.20	7.61
Cigarettes per day	22.18	13.41
Years smoked	24.83	11.96
Pack years	28.52	24.18
Addiction severity	6.10	2.13
Perceived competence (previsit)	3.64	1.75
Perceived competence (postvisit)	4.26	1.85
Rated autonomy support	4.52	1.06
Autonomous motivation	6.38	1.00

Note. Pack years = the average number of packs of cigarettes the person smokes each day \times the number of years he or she has smoked.

noncompleters had fewer years of smoking (20.86 vs. 24.83), presumably because they were younger.

It is interesting to note from Table 1 that for the sample of 239 who completed both the previsit and postvisit questionnaires, the mean for perceived competence increased significantly from before to after the doctor visits ($M_s = 3.7$ and 4.3 , respectively), $t(238) = 6.55, p < .001$.

Direct Effects on Quit Rates of Having Counseling

As already noted, if a participant reported not smoking at 6 months, the report was validated with a CO test. Five participants who reported not smoking had CO levels above 10 ppm, thus failing to confirm their self-reports. It is not a certainty that these people were lying about their cigarette smoking, both because the test has a margin of error and because the participants could have been smoking a different substance, such as marijuana. Still, for the primary analyses, we treated them as smokers, and all five were smokers in the two follow-ups. One person failed the 30-month validation and was also treated as a smoker. We repeated the analyses, treating these people as nonsmokers, and it did not change any of the results.

Table 2 presents the cessation data for the four time periods collapsed across conditions. Included are the validated and nonvalidated point prevalences as well as the validated and nonvalidated continuous variables of the number of days since last cigarette and the longest number of consecutive days of not smoking. This provides a suggestion of the overall effectiveness of the 4-As model, independent of the interpersonal style in which it is administered. Although there was not a no-treatment group in this study, the percentages of patients who quit as a result of the counseling (independent of style) was substantially higher than the rate of about 3% of smokers who quit each year on their own (Fiore et al., 1996), and the quit rates are similar to those in the original studies that validated the 4-As model (Glynn et al., 1990).

Direct Effects of Physician Style on Quit Rates

To test the effect of the experimentally manipulated physician style, we compared the quit rates at each point in time for the autonomy-supportive versus controlling condition. The counseling session did not have a significantly different effect on patients' quit rates at any point in time as a function of whether the session was assigned to the autonomy-supportive or the controlling-interpersonal-style condition. More specifically, the validated quit rates were as follows: at 6 months, 7.8% for autonomy support and 13.0% for controlling; at 12 months, 11.2% for autonomy support and 13.0% for controlling; at 30 months, 18.1% for autonomy support and 20.3% for controlling; and continuous, 5.2% for autonomy support and 9.7% for controlling. For each of these four sets of data, we did a chi-square analysis with $df = 1$ and $N = 239$. For 6 months, $\chi^2 = 1.76$ ($p = .19$); for 12 months, $\chi^2 = 0.18$ ($p = .67$); for 30 months, $\chi^2 = 0.19$ ($p = .66$); and for continuous, $\chi^2 = 1.80$ ($p = .18$). As one can see, there was a tendency (although not even marginally significant) for there to be slightly greater quit rates in the controlling condition than the autonomy-supportive condition.

For the nonvalidated results, the percentages were slightly higher in each case, but there were still no differences that were even marginally significant between conditions. Thus, there is no indication from these data that when physicians use the 4-As model for brief smoking-cessation counseling in an autonomy-supportive versus a controlling way, the style has a significant, direct effect on percentages of patients who quit smoking.

Testing the Process Model

Data from the 239 participants with complete data through the 6-month assessment were used to test the self-determination model of smoking cessation at 6, 12, and 30 months and for continuous abstinence. Table 3 shows the correlations among the motivation variables and the not-smoking outcome variables. This is simply a

Table 2
Smoking Abstinence Outcome Data at 6, 12, and 30 Months and for Continuous Abstinence
($N = 239$)

Cessation-related variable	No. of months			
	6	12	30	Continuous
Validated cessation (%) ^a	10.5	12.1	19.2	7.5
Nonvalidated cessation (%)	12.6	12.6	19.2	7.9
Validated days since last cigarette				
<i>M</i>	15.15	31.06	79.62	79.62
<i>SD</i>	46.49	95.28	225.30	225.30
Nonvalidated days since last cigarette				
<i>M</i>	16.33	32.23	83.05	83.05
<i>SD</i>	47.72	96.62	230.25	230.25
Validated longest number of days not smoking				
<i>M</i>	27.21	49.38	119.15	119.15
<i>SD</i>	50.00	98.64	231.49	231.49
Nonvalidated longest number of days not smoking				
<i>M</i>	27.96	50.13	122.53	122.15
<i>SD</i>	50.94	98.95	235.53	235.53

^a Point prevalence.

Table 3
Correlation Matrix of Motivation and Nonsmoking Composite Outcome Variables ($N = 239$)

Variable	1	2	3	4	5	6	7	8
1. Competence at Time 0	—	.68***	-.05	.22***	.23***	.20**	.20**	.18**
2. Competence at Time 1	.68***	—	-.01	.27***	.24***	.19**	.17**	.14*
3. Rated autonomy support	-.05	-.01	—	.12†	.12†	.14*	.10	.10
4. Autonomous motivation	.22***	.27***	.12†	—	.20**	.18**	.16*	.14*
5. Abstinence 6 months	.26***	.26***	.10	.19**	—	.92***	.72***	.81***
6. Abstinence 12 months	.22***	.20**	.12†	.18**	.90***	—	.78***	.86***
7. Abstinence 30 months	.22***	.18**	.07	.16*	.69***	.79***	—	.94***
8. Continuous abstinence	.20**	.15*	.07	.15*	.78***	.87***	.94***	—

Note. Values below the diagonal refer to nonvalidated abstinence and those above refer to validated abstinence.

* $p < .05$. ** $p < .01$. *** $p < .001$. † $p < .06$.

preliminary analysis, done before the SEM, and was intended to show the reader the separate bivariate relations among the pairs of variables that were incorporated into the model testing. In the SEM analyses, as explained in the description of analyses in the Method section, the SDT process model was tested using latent variables, which are essentially composite variables created by the EQS program from multiple indicators. Thus, in the correlation analyses, for the correlations to be roughly parallel to the relations that were estimated in SEM, we had to create a composite abstinence variable for each point in time and for continuous abstinence from the three variables that were used as indicators in the SEM. To do this, we standardized the three outcome variables and averaged them. The standardizing was done because the scales of the three variables were not all the same. Thus, in the SEM analyses, the three variables that we combined for the correlation analyses were used separately as indicators of the latent variable, with the EQS program combining them. As such, the two procedures are parallel but not equivalent. Inspection of Table 3 indicates that all predicted relations were significant except for the relation between rated autonomy support and autonomous motivation, which was only marginal.

Correlations of the demographic and nicotine-dependence variables at previsit baseline with the four composite outcome cessation variables (i.e., at 6, 12, and 30 months and continuous abstinence) are presented in Table 4. This analysis was done to see if any demographic or nicotine-dependence variables related significantly to the outcome composite to determine whether to add them to the model. The only significant relation was that previous quit attempts related to cessation at 6 months, but the relation was not significant for the cessation outcome at the other times. We therefore further examined the data concerning previous quit attempts, and it turned out that there were two dramatic outliers, one who reported 50 previous quit attempts and one who reported 99. When these two individuals were removed from this set of analyses, the correlation between previous quit attempts and 6-month cessation dropped from .25 to .08 and became nonsignificant, so previous quit attempt data were not included in the model. Thus, the model tested was the one shown in Figure 1, with no other variables added to it. Importantly, the correlations presented in Table 3 indicate that the paths specified in the model do tend to be related.

Estimation of the measurement model. The confirmatory factor analyses for the 6-month model showed that the hypothesized

model fit the data well. The overall indicators of goodness of fit for 6 months were good, robust $\chi^2(180, N = 239) = 350.2, p < .05$; NNFI = 0.95; robust CFI = .95; and RMSEA = 0.07. Because the measurement model was acceptable, the structural models were analyzed.

Estimation of the SEMs. The results of testing the structural models at 6, 12, and 30 months and for continuous cessation are presented in Table 5. Figure 2 presents the estimated model for continuous cessation. The fits of the models to the data were good. In each of the four models, although the chi-square was significant, the three fit indices all suggested a good fit.

For continuous cessation, the intervention significantly predicted ratings of physician autonomy support. The robust parameter estimate (*rpe*) for that path was .62, $p < .001$. Rated autonomy support in turn predicted patients' autonomous motivation for not smoking ($rpe = .11, p < .05$). Autonomous motivation did not predict postvisit perceived competence after controlling for baseline perceived competence ($rpe = .13, p = .11$). However, autonomous motivation did significantly predict continuous abstinence ($rpe = .13, p < .001$) but perceived competence did not ($rpe = .11, ns$).

Table 4
Correlations of Demographic and Nicotine-Dependence Variables With the Outcome Composite Variable ($N = 239$)

Variable	No. of months			
	6	12	30	Continuous
Age	.04	.07	.11	.12
Gender ^a	-.02	-.04	-.04	-.06
Married or living together ^b	-.05	-.04	-.05	-.08
Race ^c	-.11	-.06	-.04	-.04
Income	.02	.00	.03	.04
Education	.05	.02	.08	.04
Previous quit attempts	.25***	.12	.09	.10
Cigarettes per day	.02	.01	.03	.05
Years smoked	-.01	.03	.08	.09
Pack years	-.01	.01	.07	.08
Addiction severity	-.12	-.11	-.12	-.04

^a 0 = male; 1 = female. ^b 0 = married or living together; 1 = not married or living together. ^c 0 = White; 1 = non-White.
*** $p < .001$.

Table 5
Standardized Parameter Estimates for Paths in the Self-Determination Model and for Fit Indices (N = 239)

Path to variable	No. of months			Continuous
	6	12	30	
Paths in the self-determination model				
Intervention to rated autonomy support	.62***	.62***	.62***	.62***
Rated autonomy support to autonomous motivation	.11*	.11*	.11*	.11*
Autonomous motivation to competence (T1)	.13	.13	.13	.13
Perceived competence (T0) to perceived competence (T1)	.68***	.68***	.68***	.68***
Autonomous motivation to abstinence	.13***	.14***	.12***	.13***
Perceived competence (T1) to abstinence	.15*	.13†	.11	.11
Fit indices				
SB/χ ² (df = 200)	372.08	383.25	379.16	372.70
NNFI	.95	.95	.95	.95
Robust CFI	.95	.95	.95	.95
RMSEA	.07	.07	.07	.06

Note. SB/χ² = Satorra-Bentler chi-square, corrected for multivariate nonnormality; T = time; NNFI = nonnormed fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation. * p < .05. *** p < .001. † p < .06.

Identical models were run for the 6-, 12-, and 30-month data. In general, these models were very comparable to the continuous abstinence model, with similar *rpe* values. The important difference concerned perceived competence for quitting, assessed following the doctor visit. Specifically, perceived competence did predict significant independent variance in quitting at 6 months, and it marginally predicted abstinence at 12 months, but it did not predict abstinence at 30 months, as it had not for continuous abstinence. Thus, it appears that feeling confident about being able to quit when beginning one's attempt is an important predictor of cessation over the relatively short term but is less predictive over

the longer terms. On the other hand, autonomous motivation assessed at the beginning of the quit attempt remained a comparably strong and significant predictor over the 30-month period.

In each model, autonomous motivation was only marginally predictive of change in patients' perceived competence for quitting. When the analyses were rerun without this path, the fit of the models deteriorated significantly. As previously noted, the increase in perceived competence from before to after the doctor visit was highly significant, and this analysis indicates that even though the *rpe* for the path from autonomous motivation to perceived competence was only marginally significant, it appears that

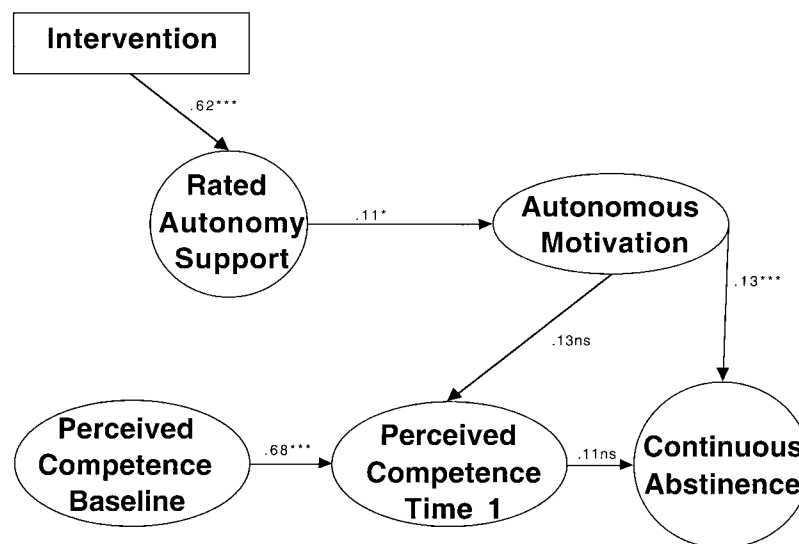


Figure 2. Standardized parameter estimates for the self-determination theory-based structural model (using the structural equation modeling software EQS Version 5.7a). * p < .05. *** p < .001.

the contribution to the change made by autonomous motivation is important to the overall model fit.

Discussion

The current study was designed to examine the principles of self-determination theory with respect to predicting smoking cessation in the context of primary care physicians' using the NCI's clinical guidelines to counsel adult outpatients. We used a dual approach: an overall test of the SDT process model and a test of the direct effect of the experimentally manipulated physician style on cessation. The test of the SDT model showed that the processes specified by the theory did predict cessation, but the study did not yield a direct effect of physician style on cessation rates.

SEM was used to show that the self-determination process model for smoking cessation fit the data well for the short term (6-month outcome) as well as for the maintenance of smoking cessation over 12 and 30 months. Autonomous motivation for quitting significantly predicted abstinence at all three times and continuously, whereas perceived competence significantly predicted cessation at 6 and 12 months but not at 30 months or continuously.

More specifically, the study showed that the two interpersonal styles used randomly by physicians in delivering brief smoking cessation counseling were reliably distinguished by trained observers, with the physicians being viewed as more autonomy supportive with the patients who had been randomized to the autonomy-supportive condition than with those in the controlling condition. Further, the more autonomy supportive the physicians were observed to be, the higher was the patients' reported autonomous motivation for quitting. The data were less clear about the relation between autonomous motivation and changes in patients' perceived competence from before to after the physician visit because this path was only marginally significant in each model. Nonetheless, including this path in the model resulted in a better overall fit than did removing the path. Most importantly, patients' autonomous motivation for quitting assessed just after the doctor visit significantly predicted cessation at each time, and perceived competence assessed at the same time as autonomous motivation also predicted cessation over the shorter periods. Fit of the process model to the data in this study provided important additional support for the SDT model, because this is the first study in which assessment of provider autonomy support involved ratings by trained objective observers rather than patients' self-reports.

Continuous quit over three points is a more conservative estimate of quitting than is a single point prevalence, and it better reflects the health benefits the patients derive from quitting. Predictably, the percentage of continuous abstinence was lower than the percentage abstinent at any one point. Importantly, however, patients who maintain abstinence over 12 months experience a 50% reduction of cardiovascular mortality (US DHHS, 1990), and additional risk reduction is gained by even longer term abstinence. In the test of the process model, we used continuous smoking abstinence over 30 months as the primary outcome because of its importance for patients' health. It is encouraging that continuous cessation in smoking was significantly predicted by patients' autonomous motivation, which was predicted by observer ratings of the autonomy supportiveness of the physicians' counseling style. This result is consistent with a meta-analysis organized by AHCPR

(Fiore et al., 1996), which concluded that one of the most important factors for improving quit rates is intratreatment social support in the medical encounter.

The current results showed the effect of the experimentally manipulated interpersonal style used by the physician to be only indirect rather than direct, thus failing to support our hypothesis that there would be greater cessation in the autonomy-supportive condition. It is important to consider why there was not a direct effect of the physician style on cessation given that the process model showed that the experimental condition influenced rated physician autonomy support, which in turn predicted patients' autonomous motivation, which predicted smoking cessation. Although there is no clear account of the failure to find a direct effect, several factors may have contributed to it.

First, in this study, each physician counseled half of his or her patients with an autonomy-supportive style and half with a controlling style. This feature of the design was considered important because it controlled for individual differences in the physicians' typical styles, but because the same physicians were using both styles, it is likely that the average difference in the styles used was relatively small. Although trained observers who listened carefully for the degree of autonomy supportiveness of the physicians' style were able to detect a difference ($M_s = 5.18$ for autonomy support, and 3.90 for controlling), $t(237) = 11.74$, $p < .001$, it is unclear whether patients would have experienced the difference as meaningful.

Second, the problem of smoking cessation is notoriously intractable. The brief (approximately 10 min) counseling session, with the possibility of a similarly brief follow-up contact either in person or by phone, appears to have had a meaningful impact on rates of smoking cessation (independent of physician style) relative to patients' quitting on their own, although we did not have a no-counseling control group to test this effect. Still, even if having brief counseling by a physician did affect patients' cessation rates, the more subtle factor of the quality of the interpersonal style used by the physician was obviously not salient enough during the brief interactions to affect cessation directly. Indeed, it may be that the most important time for practitioners to be accepting and autonomy supportive of patients is when they have made a quit attempt and failed. This would suggest that the direct effects of physicians' interpersonal style would be more likely to show up in longer term counseling relationships.

Recently, the PHS (Fiore et al., 2000), much like the NCI and AHCPR had previously done, strongly advised that physicians should raise the issue of smoking cessation with every patient who smokes at every office visit by the patient. Data from Thorndike, Rigotti, Stafford, and Singer (1998) indicate that most physicians do not do this, but if they were to follow this recommendation, it is possible that the counseling session would have a meaningful impact on cessation rates and that the use of an autonomy-supportive interpersonal style by the physicians would contribute significant variance toward increased cessation over the long term.

A third possibility for the lack of a direct effect is that the sample was not adequate. A power analysis, using the range within which the quit rates fell in this study, showed that the difference in quit rates would have had to be greater than 8% to be significant and that it was probably too large a difference to expect for such a subtle manipulation in such a brief contact. However, the lack of power does not provide an account of our nonsignificant direct

effect, because there was a slight tendency for the effect to be in the opposite direction from what was predicted, particularly at the 6-month assessment. This effect was not even marginally significant, so it could easily have been a chance occurrence, but it does mean that adding patients to this study would probably not have resulted in the hypothesized outcome.

It is worth considering briefly what might have caused the trend here if it were not just a chance effect. When the physicians were controlling in using the 4-As, they made a strong direct statement that patients should stop smoking for the sake of their health. It is possible that in spite of the controlling locution, patients heard the statement as an indication that the physicians were really concerned about them and their health and thus did not feel controlled by it. If the advice statement in the autonomy-supportive condition were not as clearly made, this could have counteracted the positive effects that would be expected from the physicians' aligning themselves with the patients by being autonomy supportive. Future research will need to concentrate on isolating physician behaviors and styles that promote autonomous motivation and smoking cessation among patients when physicians are providing the PHS-recommended counseling.

The PHS (Fiore et al., 2000), in its recently published guidelines for physicians' treating nicotine dependent patients, has added a fifth A to the model. It now asserts that physicians should *assess* patients' intentions with respect to quitting, thereby taking the patients' perspective and supporting their autonomy with respect to their smoking. The approach we have outlined in this article is, accordingly, very consistent with the newest guidelines. Because the PHS did not provide a way of assessing autonomy or autonomy support, additional research such as that presented in this article, which provides ways of assessing these constructs, seems particularly important.

One interesting aspect of the results of the current study is that the cessation rates increased over time. A larger percentage of patients had quit by 12 months than by 6, and an even larger percentage had increased by 30 months. There are at least two possible reasons for this. First, smokers who quit typically require multiple quit attempts, a point that is now acknowledged in the PHS guidelines (Fiore et al., 2000). Thus, with the passage of time, it is possible that patients in this study who were motivated by the physician contact would have made multiple quit attempts and would finally have been successful by later assessments. Second, as noted earlier, 61% of the patients saw their own doctors, and it is possible that they saw their doctors additional times beyond the one follow-up that was called for in the study design. Although it is unlikely that they would have had further visits to discuss only their smoking, it is possible that smoking was discussed when they had appointments with their doctors for other medical issues. Further, even if smoking was not discussed on a subsequent visit, seeing their doctor might have reminded them of the issue and of their earlier counseling contacts. In an attempt to determine whether patients' seeing their own doctor and possibly having had subsequent contacts might have accounted for the increase in quit rates over time, we compared the quit rates at each point in time for patients seeing their own versus another doctor. The results showed no effect on quit rate for any of the times or for continuous abstinence (all F s < 1.0). Thus, it is possible that having subsequent visits with their doctors may have helped patients quit, but there is no clear evidence of that. It is also possible that more

autonomously motivated people who saw another doctor in the study would have been motivated to seek additional help from some other source, thus helping to increase the quit rates over time for the patients seeing other doctors.

Limitations of this study included a relatively small number of participants for a smoking-cessation study, particularly one in which the intervention involved a relatively subtle difference in interpersonal style used by the physicians during a brief office visit. A further limitation concerned some patients seeing their own doctors and others seeing a study doctor, because we have no record of subsequent visits the patients who saw their own doctors might have had.

To summarize, when physicians utilized the NCI/AHCPR guidelines for smoking-cessation counseling in a manner that supported the smokers' autonomy, they were viewed as more autonomy supportive by trained observers and that led patients to be significantly more autonomously motivated to quit. In turn, patients who were more autonomously motivated to quit were more likely to have quit smoking at 6, 12, and 30 months after the interview and to remain nonsmoking continuously over the 30-month period. Perceived competence contributed some additional prediction of cessation during the initial assessments. Continued research of this sort is called for in light of the profound implications that smoking cessation has for the health of patients who smoke and in light of the recent PHS guidelines for smoking cessation, which now acknowledge the importance of patient autonomy.

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