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The Process of Smoking Cessation: An Analysis of Precontemplation, Contemplation, and Preparation Stages of Change

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Traditionally smoking cessation studies use smoker and nonsmoker categories almost exclusively to represent individuals quitting smoking. This study tested the transtheoretical model of change that posits a series of stages through which smokers move as they successfully change the smoking habit. Subjects in precontemplation (n = 166), contemplation (n = 794), and preparation (n = 506) stages of change were compared on smoking history, 10 processes of change, pretest self-efficacy, and decisional balance, as well as 1-month and 6-month cessation activity. Results strongly support the stages of change model. All groups were similar on smoking history but differed dramatically on current cessation activity. Stage differences predicted attempts to quit smoking and cessation success at 1- and 6-month follow-up. Implications for recruitment, intervention, and research are discussed.

Traditionally smoking cessation outcome has been viewed as a dichotomy. Smoker and nonsmoker categories have been used almost exclusively to represent the population of individuals quitting smoking. As smoking modification researchers began to confront the issues of resistance and recidivism (Bernstein, 1970; Hunt & Bespalec, 1974; Lichtenstein & Danaher, 1976), cessation came to be understood more as a process than as a dichotomous product (DiClemente & Prochaska, 1982; Pechacek & Danaher, 1979; Prochaska & DiClemente, 1983).

Understanding and examining this process of change for smoking cessation as well as other problematic behaviors has been the central focus of the transtheoretical framework or model developed by Prochaska and DiClemente (1984). They propose that two interrelated dimensions are needed to adequately assess behavior modification of smoking. The first dimension is labeled the *stages of change*. These four stages represent the temporal, motivational, and constancy aspects of change (DiClemente & Prochaska, 1985). The second dimension, called *processes of change*, focuses on activities and events that create successful modification of a problem behavior. These 10 processes of change represent coping activities used to modify smoking behavior (Prochaska, Velicer, DiClemente, & Fava, 1988).

Precontemplation, contemplation, action, and maintenance are the four stages enumerated in the transtheoretical model (Prochaska & DiClemente, 1986). Relapse is an event that terminates the action or maintenance phase prompting a cyclical movement back through the initial stages of precontemplation or contemplation. Particularly for addictive behaviors like cigarette smoking, movement through the stages involves a cycling and recycling process (DiClemente & Prochaska, 1985; Prochaska, Velicer, DiClemente, Guadagnoli & Rossi, 1990).

Stages of change have been identified in a variety of settings with a wide range of problems or target behaviors. A stages of change scale (URICA; McConnaughy, Prochaska, & Velicer, 1983) measures subjects' attitudes toward change on 32 items that represent precontemplation, contemplation, action, or maintenance statements and yields stage scores and profiles. Stage of change profiles confirming the stage model have been found with outpatient psychotherapy clients (McConnaughy, DiClemente, Prochaska, & Velicer, 1989); outpatient alcoholism treatment patients (DiClemente & Hughes, 1990), weight control program participants (O'Connell & Velicer, 1988), and head injury rehabilitation patients (Lam, McMahon, Priddy, &

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Gehred-Schultz, 1988). In addition, stages have been assessed using a classification schema based on attitudes and behaviors regarding change of a target behavior. Using the classification schema, we have identified groups of subjects in various stages of change for smoking cessation (Prochaska & DiClemente, 1984; 1985). Evidence for the validity of the stage classification is strong (DiClemente & Prochaska, 1985). Stage classifications for smoking cessation are consistently related to self-efficacy (DiClemente, 1986; DiClemente, Prochaska, & Gibertini, 1985), to a decision-making construct (Velicer, DiClemente, Prochaska & Brandenburg, 1985), and to the processes of change for smoking cessation (DiClemente & Prochaska, 1985; Prochaska, Velicer, DiClemente, & Fava, 1988) in a consistent and theoretically compatible manner. An analysis of stage profiles of subjects over time (longitudinal typologies) demonstrated that processes of change vary in use across the stages of change with experiential processes peaking in the contemplation stage and behavioral processes in the action and maintenance stages (Prochaska et al., in press). In addition to these empirical studies, stages have been used as a useful framework to examine the population of smokers in the United States (U.S. Department of Health and Human Services; USDHHS, 1988) and to conceptualize treatment of addictive behaviors (Marlatt, Baer, Donovan, & Kivlahan, 1988). There is substantial support for the construct validity of the stages model and growing support for predictive validity (Lam et al., 1988; Biener, Abrams, & Follick, 1988).

This study will provide the most extensive test to date of the stages of change model with a large sample of smokers volunteering for a minimal intervention smoking cessation research program. Using the classification schema, subjects will be placed in precontemplation and contemplation stages of change. In this study the contemplation stage has been subdivided to create a preparation stage, as was proposed in an early formulation of the stages model. Comparisons among smokers in the precontemplation, contemplation, and preparation stages will be analyzed for process and outcome differences on relevant smoking history dimensions as well as on prospective cessation activities. On the basis of previous studies, smokers in these three stages will demonstrate a clear developmental sequence of movement toward smoking cessation. Significant differences across stages are hypothesized for smoking cessation change process activity and for the mediating variables of self-efficacy and decisional balance, as well as for the standard cessation outcome measures over 6 months. We will analyze extensively the process of cessation from a stage of change perspective.

Method

Subjects

Subjects volunteered for a research project on minimal interventions for smoking cessation and were recruited to represent four groups: precontemplators, contemplators, subjects who were prepared or ready for action, and action subjects. Subjects were randomly assigned to interventions stratified by stage. For the purposes of this article, only those subjects still smoking (precontemplators, contemplators, and subjects prepared for action) will be included, and only stage effects will be analyzed. Because subjects were recruited at two sites (Texas and Rhode Island), volunteer groups from each site will be described first; then the breakdown of subjects by stage will be given, combining subjects from both sites.

Texas subjects were 691 volunteers who responded to newspaper, radio, and other media advertisements seeking participants to test materials developed for smokers in various stages of change. Subjects had a mean age of 40 (SD = 11), started smoking at age 17, and were smoking an average of 27 cigarettes per day. Sixty-four percent of the subjects were female. Eighty-six percent were White, 9.5% Black, 3% Hispanic, and 1% other. The majority of subjects had a high school or greater education level (93%) and were married (52%). Average income for this group of subjects was in the $15–$25 thousand per year range.

Rhode Island subjects were 775 volunteers who responded to advertisements similar to those in Texas. Subjects had a mean age of 43 (SD = 12), started smoking at 16 years of age, and were smoking an average of 27 cigarettes per day. Sixty-two percent of the subjects were female, and 98% were White. The majority of subjects had a high school or greater education level (94%) and were married (64%). Average income for this group of subjects was in the $15–$25 thousand per year range.

Combining subjects from both sites yielded the following groups of subjects in each of the stages of change. Justification for combining sites is presented in the Results section.

Precontemplation stage. These 166 subjects were smoking and were not seriously considering quitting within the next 6 months, the defining characteristics for precontemplation (PC). They represented 11.3% of the total sample of smokers, were 66% female, and averaged 41 years of age. These subjects averaged 29 cigarettes per day, began smoking at age 17, and had smoked for an average of 24 years.

Contemplation stage. These 794 subjects were smoking and seriously considering quitting within the next 6 months; however, they were not considering quitting within the next 30 days, had not made a quit attempt of 24 hr in the past year, or both. They represented 54.2% of the total sample of smokers, were 66% female, and averaged 41 years of age. These contemplation (C) subjects averaged 29 cigarettes per day, began smoking at age 17, and had smoked for an average of 23 years.

Preparation stage. These 506 subjects were seriously considering quitting in the next 6 months and were planning to quit within the next 30 days. In addition they had made a 24-hr quit attempt in the past year. These prepared for action (PA) subjects represented 34.5% of the total sample of smokers, were 58% female, and averaged 42 years of age. They averaged 24 cigarettes per day, began smoking at age 17, and had smoked for an average of 23 years.

The stage classification algorithm was mutually exclusive so that all smoking subjects were classified in only one stage. Intention to quit in the next 6 months was used to identify precontemplators. Then both intention to quit in the next 30 days and quit attempt in the past year were used to subdivide contemplators from prepared subjects. All subjects who were smoking at screening were classified in this manner. Both sites used the same classification algorithm.

Measures

Smoking Abstinence Self-Efficacy (SASE, DiClemente, Prochaska, & Gibertini, 1985). The SASE measure assessed the smoker's level of confidence that he or she would not smoke in 20 challenging situations. Level of confidence was indicated on a 5-point Likert scale from (1) *not at all* to (5) *extremely confident*. This measure has been revised since its original 12-item format (DiClemente, 1981) and was expanded to 31 items (DiClemente, Prochaska, & Gibertini, 1985) and then pared down to the current 20-item format. The various forms of this self-efficacy scale for smoking have demonstrated good internal consistency (Cronbach alpha = .88–.92) and both construct and predictive validity. This scale has predicted maintenance for both therapy changers and

self-changers (DiClemente, 1981) and movement from contemplation into action and maintenance (Prochaska, DiClemente, Velicer, Ginpil, & Norcross, 1985). In a cross-sectional analysis, self-efficacy scores discriminated between subjects representing each of the four stages of change. Included in this self-efficacy assessment is a Temptation scale that assesses the level of temptation on a similar 1–5 Likert scale in the same 20 situations. The Temptation scale has psychometric properties comparable to the Self-Efficacy scale and correlates −.68 with efficacy scores. (DiClemente, Prochaska, & Gibertini, 1985).

Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). The PSS is designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. It is considered a global measure of how much perceived stress subjects have experienced within the past month. The original scale contained 14 items. For this study a shorter 4-item version (Cohen & Williamson, 1987) was used. This short version is made up of the items that correlated most highly with the original scale and has been judged to be a useful measure of perceived stress for situations requiring a short scale.

Fagerstrom Tolerance Questionnaire (FTQ; Fagerstrom, 1978). The FTQ is an 8-item scale designed to measure physical dependence on nicotine. The questionnaire combines responses about the smoking habit (number of cigarettes smoked, minutes to first morning cigarette, smoking while ill, etc.) to create a measure of addiction. The FTQ has been used to discriminate level of addiction, withdrawal responses, heart rate, and past smoking behavior. It focuses on observable behavior of the smoker instead of less clear judgments, such as emotions. In this study, one item of the FTQ, brand type, was not used to calculate the total score.

Smoking Decisional Balance scale (SDB; Velicer, DiClemente, Prochaska, & Brandenburg, 1985). This 20-item questionnaire assesses 10 pros and 10 cons of smoking. Subjects rate agreement with each item on a 5-point Likert scale from (1) *not at all* to (5) *very much*. Both Pros and Cons scales of the SDB have been found to have high internal consistency (alpha = .88 and .89, respectively). The Pros and Cons scales reveal highly significant differences for different stages of change in cross-sectional analyses. In longitudinal analyses, the pros and cons have been salient variables in predicting movement from precontemplation to action.

Smoking Processes of Change scale (SPC; DiClemente & Prochaska, 1985; Prochaska et al., 1988). This 40-item questionnaire measures the 10 processes of change from the transtheoretical model with 4 items each. Subjects indicate the frequency of these 40 activities or events within the last month on a 5-point Likert scale from (1) *never* to (5) *repeatedly*. This instrument has demonstrated high reliability, internal validity, discriminative validity, and predictive validity.

Demographic questionnaire. Demographic data including age, gender, education, and income were collected on a separate assessment sheet.

Smoking history questionnaire. Smoking history data collected include age of acquisition, parent and peer smoking patterns, number of previous quit attempts, as well as current level of smoking, confidence to be able to quit or maintain nonsmoking, current concerns about smoking cessation, and the Fagerstrom assessment questions. The 18-item Reasons for Smoking scale (Horn, 1969), which assesses types of smokers, was also included.

Procedures

Subjects were recruited in both Texas and Rhode Island through media advertisements and were offered $5 for completing questionnaires as well as an opportunity for 10 bonus prizes amounting to $2,000 at each round of data collection. Subjects called in to volunteer and were screened by telephone for initial stage data. Subjects were randomly assigned, stratified by stage, to one of four minimal intervention conditions: (a) American Cancer Society/American Lung Association materials and manuals; (b) transtheoretical manuals; (c) transtheoretical manuals and individualized written feedback based on pretest, posttest, and 6-month questionnaires; and (d) transtheoretical manuals and individualized written feedback plus a series of four personalized counselor calls at pretest, posttest, 3 months, and 6 months. All interventions were done by mail or phone contact or both.

Subjects who were smoking at telephone screening were mailed pretests and told they would be sent materials when they returned the questionnaires. When questionnaires were returned, subjects were randomized and sent materials. The recruitment phase of the project lasted approximately 2–3 months. Subjects in the precontemplation, contemplation, and preparation groups were equally represented in each intervention group.

At each assessment, subjects were asked to provide names of significant others who could validate their smoking patterns. In the initial stages of data collection, this procedure acted as a bogus pipeline because significant others were not contacted. Approximately 1 and 6 months after pretest, subjects were sent follow-up questionnaires similar to the posttest battery. Follow-up assessments continued every 6 months for the next 2 years. Only 6-month follow-up data were used in the current analysis, inasmuch as pretest stage was most relevant to the first 6 months after assessment, and interventions continued through this time period.

Results

A preliminary analysis compared Texas and Rhode Island subjects to assess whether there were significant demographic or smoking history differences. There were no significant differences for number of cigarettes smoked per day, age began smoking, proportion of subjects in each stage, duration of the smoking habit, and the Fagerstrom measure of addiction. There were small but significant differences in number of quit attempts in the past year (Texas $M = 2$; Rhode Island $M = 1.8$, $p < .05$) and in length of most current quit attempt (Texas $M =$ 31.6 days; Rhode Island $M = 44.8$ days, $p < .05$). When we examined Site × Demographic variables, there were no significant differences in sex distribution, education levels, mean age, and average income range. Texas had a greater distribution of ethnicity, with 87% White, 9% Black, and 3% Hispanic, than did Rhode Island, which was 98% White, reflecting the ethnic differences in state populations.

Although there were a few differences between sites, the majority of smoking history and demographic variables were quite similar. Thus, subsequent analyses combined the samples in order to maximize number of subjects in the various stages. In this study comparisons were made across groups of precontemplators, contemplators, and prepared subjects on a number of smoking history and change variables, using regression and logistic regression procedures. Whenever there was a conceptually similar group of measures, a multivariate analysis of variance (MANOVA) was used in a preliminary analysis. Because of the large number of comparisons being made, an alpha level for significant differences of $< .01$ was chosen to reduce experi-

mentwise error rate, and a more conservative Tukey procedure was used for post hoc analyses.

Demographic and Smoking History Comparisons

There were no significant differences among precontemplator (PC), contemplator (C), and prepared subjects (PA) on age, education levels, and sex distribution, using analysis of variance (ANOVA) and chi-square analyses. There was a tendency for a greater percentage of women to be found in PC (66.1%) and C (65.6%) groups than in the PA (57.7%) group. However this difference did not reach our predetermined level of significance.

Table 1 indicates significant differences among groups on certain smoking variables. We examined smoking history, current smoking habit patterns, and cessation history. No stage differences emerged on smoking history. Current stage or status with respect to change had little to do with historical events such as years of smoking and age of initiation. When current smoking patterns were examined, however, many differences emerged. Prepared subjects (PA) were smoking fewer cigarettes per day and were less addicted as measured by the Fagerstrom scale. Precontemplator (PC) and Contemplator (C) subjects appeared similar on these variables with both being significantly different from PA stage subjects. The PA group had the lowest scores on all current smoking habit variables. Historically, the PA subjects' habit appeared nondistinct from the other groups with the sole exception that they did report slightly fewer maximum number of cigarettes smoked lifetime. However, 33 cigarettes per day reported by PA subjects was a substantial number and certainly not indicative of light smoking. In contrast to the PC and C groups, the PA group members appeared to be successfully modifying or in the process of modifying their current smoking habit. They obtained less pleasure from smoking, were less addicted, and were smoking less. These differences did not appear to be due to chance but to movement through the cycle of change.

Cessation history variables supported this interpretation. Prepared smokers were significantly more active in the process of changing their smoking behavior. They had the greatest number of lifetime quit attempts (5.0) and in the past year had been much more active in making 24-hr quit attempts. In fact, almost 6% of this group reported being in a current 24-hr quit attempt at the time they completed the pretest, possibly using the pretest as a cue to make another quit attempt. Preparation stage smokers were clearly prepared and ready for action.

Current smoking habit and cessation variables supported the model of movement through the stages of change (see Table 2). Prepared smokers appeared quite different from those in other stages in their cessation activity, although contemplator and precontemplator subjects appeared similar along most of these dimensions. The one dimension where PC differed signifi-

Table 1
Pretest Comparisons of Smoking Habit Variables Across Stages of Change

Variable	Precontemplation (n = 166)		Contemplation (n = 794)		Preparation (n = 506)		Tukey comparisons
	M	*SD*	*M*	*SD*	*M*	*SD*	
Smoking history							
Age of initiation	17.3	5.2	16.7	4.4	16.9	4.3	—
Total years smoking	23.9	12.3	22.9	12.2	22.8	12.9	—
Years smoking before first quit attempt	14.8	15.8	15.0	13.5	15.5	12.9	—
% spouse current smoker	36.7		40.2		40.4		—
% father current smoker	50.6		51.3		51.0		—
% mother current smoker	33.1		34.5		27.7		—
Current smoking							
No. cigarettes/day*	29.1	15.2	28.7	15.4	24.0	16.3	PA < PC, C
Life maximum No. cigarettes/day*	34.8	15.7	36.3	15.6	32.7	15.6	PA < C, PC
Addiction level (Fagerstrom)*	6.5	1.9	6.6	1.8	5.8	2.0	PA < PC, C
Time to first morning cigarette (minutes)*	30.5	38.9	36.8	77.6	62.1	100.6	PC, C < PA
Horn's typology							
Stimulation	7.6	3.6	7.8	3.1	7.3	3.2	—
Handling	6.5	2.8	6.4	2.5	6.3	2.5	—
Relaxation*	11.6	2.0	10.6	2.3	10.1	2.5	PA < C < PC
Crutch: tension reduction	11.6	2.6	11.6	2.6	11.2	2.6	—
Craving and addiction*	11.3	2.2	11.3	2.3	10.6	2.5	PA < PC, C
Habit	7.5	2.4	7.7	2.6	7.2	2.6	PA < C

Note. All comparisons were made using regression procedures. Post hoc comparisons were made using the Tukey procedure. Tukey comparisons that were significant are shown using a < symbol. If differences were not significant, a comma was used. Dash = no significant differences. Fagerstrom = Fagerstrom Tolerance Scale.
* $p < .01$

Table 2
Pretest Comparisons of Smoking Change History Variables Across Stages of Change

Change history	Precontemplation (n = 166)		Contemplation (n = 794)		Preparation (n = 506)		Tukey comparisons
	M	*SD*	*M*	*SD*	*M*	*SD*	
No. of prior quit attempts*	2.2	2.3	3.5	2.8	5.0	2.9	PC < C < PA
Quit attempts past year*	0.9	1.8	1.1	1.9	3.3	2.6	PC, C < PA
Length of prior quit (days)	33.9	130	38.9	137	22.9	89	—
% reporting not currently smoking at pretest*	0.0		0.3		5.7		PC, C < PA
Concerns about quitting*	29.4	13.5	34.9	13.2	36.6	12.0	PC < C, PA
Time since first quit attempt (years)	9.5	12.8	9.7	10.8	9.1	8.8	—
Frequency of quit attempts over time* (Time since first quit/no. of prior quits)	5.7	6.5	3.9	6.2	2.3	2.9	PA < C < PC

Note. All comparisons were made using regression procedures. Post hoc comparisons were made using the Tukey procedure. Tukey comparisons that were significant are shown using a < symbol. If differences were not significant, a comma was used. Dash = no significant differences.
* $p < .01$.

cantly from the C subjects was previous quitting. Precontemplators had significantly fewer lifetime quit attempts than C or PA subjects, which confirmed their reluctance or resistance to cessation and supported their early status in the cycle of change. Although differences were most noteworthy, it is quite important to underscore the fact that stage differences were unrelated to smoking history. Smokers in different stages of change did not represent different types of smokers by history; they differed by change activity.

Self-Efficacy Comparisons

Stage comparisons were performed using standardized scores with MANOVA, regression, and post hoc procedures for the measure of temptation to smoke and self-efficacy. These comparisons demonstrated significant differences among all three stage groups (see Table 3). PA subjects had significantly higher levels of confidence to stop or maintain nonsmoking and efficacy to abstain from smoking across various cues to smoke. Contemplator (C) subjects were significantly different from both PC and PA groups on these dimensions. Exactly the opposite pattern of differences emerged for levels of temptation to smoke. PC subjects were the most tempted, followed in numerical sequence by C and PA subjects. A simple arithmetical calculation subtracting efficacy from temptation scores for the groups indicates that the gap between confidence to abstain and overall temptation significantly narrowed and shifted across the stages. Inasmuch as this relationship between efficacy and temptation levels has been related to cessation of smoking (DiClemente, Prochaska, et al., 1985), this pattern dramatically confirmed stage differences among current smokers.

Decision-Making Comparisons

Decision making, particularly an individual's evaluation of the pros and cons of a particular behavior, has been identified by Janis and Mann (1977) as a critical component in the modification of a behavior. Again significant differences among all three stages emerged on standardized score comparisons (see Table 3). Importance of the positive aspects of the smoking habit decreased significantly across groups with PC subjects holding smoking pros most important and PA subjects holding pros least important. As expected, the reverse pattern emerged for the importance of the negative aspects of the smoking habit. The arithmetical difference between pros and cons across groups demonstrated a significantly increasing shift in decisional balance against smoking among PA subjects compared with PC subjects. Decisional considerations supported the stages of change classification schema.

Processes of Change Comparisons

Specific activities related to smoking cessation have been summarized in the 10 processes of change. Comparisons among stage of change groups for the processes of change are enumerated in Table 4. Precontemplators were the least active and the prepared subjects the most active on almost every process. Although significant differences among all three stage groups were plentiful and the pattern of differences across all processes were very similar, actual scores varied in interesting ways. On the more cognitive/affective processes like consciousness-raising, dramatic relief, and self-reevaluation, C and PA subjects were more similar and differed more from PC subjects. On the self-liberation process, which is a measure of commitment, there was a graded pattern of differences. On the more behavioral processes of stimulus control and counterconditioning, C and PC subjects were more similar. Processes of change patterns support the interpretation that PA subjects were more actively modifying their smoking habit. C subjects were gather-

Table 3
Standardized Score Comparisons for Self-Efficacy and Decisional Balance Measures Across Stages of Change

Variable	Precontemplation (n = 166)		Contemplation (n = 794)		Preparation (n = 506)		Tukey comparisons[a]
	M	SD	M	SD	M	SD	
Efficacy[b]							
Temptation*	53.0	9.2	51.0	10.0	47.5	9.7	PA < C < PC
Self-efficacy (SE)*	44.4	9.0	48.8	9.3	53.8	10.1	PC < C < PA
Tempt-SE difference*	8.7	16.6	2.1	17.1	−6.3	17.6	PA < C < PC
Decisional balance							
Pros of smoking*	53.6	10.4	50.5	9.9	48.0	9.7	PA < C < PC
Cons of smoking*	42.4	10.6	50.3	9.5	52.0	9.4	PC < C < PA
Pro–con difference*	11.1	14.1	0.3	12.7	−4.0	12.8	PA < C < PC

Note. All comparisons were made using regression procedures on standardized T scores (M = 50; SD = 10).
[a] The standardization sample consisted of all 1,466 smokers in the study. Post hoc comparisons were made using the Tukey procedure. Tukey comparisons that were significant are shown using a < symbol. If differences were not significant, a comma was used.
[b] A preliminary multivariate analysis of variance was significant ($p < .01$) for temptation and self-efficacy scores by group and for Pro and Con scores by group.
* $p < .01$.

ing information and evaluating their smoking habit, and PC subjects were doing the least across all change processes.

One-Month Posttest Comparisons

Stage assignment at pretest should be predictive of participation in the intervention as well as cessation activity with individuals closer to the action stage engaging in more of these activities. At 1 month, stage of change groups differed in predicted fashion on use of self-help manuals during the previous month. PA subjects reported greater use and thus more exposure to the treatment. In turn, C subjects used the manuals more than did PC subjects (see Table 5).

Dramatic differences emerged in the proportion of subjects making a 24-hr quit attempt in the past month. A majority of the PA group (56%) made a quit attempt, whereas only 8% of the PC group attempted cessation. Some larger number of C stage subjects made an attempt (24%). Average number of quit attempts also significantly differed among stage groups and was greatest for PA subjects. This cessation activity was reflected in the percentage of point prevalence abstinence reported. At 1 month, only a small percentage (1.9%) of the PC group were currently not smoking. That percentage more than doubled by stage, increasing to 5.4% for the C and 13.3% for the PA subjects. The current nonsmoking prevalence rate represented a quarter of each quit attempt percentage. The same pattern of significant differences emerged when we used the more conservative procedure of counting missing subjects as smokers. One-month point prevalence rates with this adjustment were as follows: PC = 1.8%, C = 4.8%, and PA = 11.9%. This 1-month posttest data clearly supports the stage of change classification of these smokers. Hypothesized predictive validity of the stage model both for cessation attempts and cessation success are strongly supported.

Six-Month Follow-up

Six months is the time frame encompassed by our categorization of the stages. Precontemplators were not considering quitting in the next 6 months. Contemplators were, on the other hand. The 6-month follow-up should provide a clear confirmation or disconfirmation of the utility of stage classifications. The results illustrated in Table 5 strongly confirm the stage model.

Although level of manual use reported at 6 months did not significantly differ among the stages, cessation activity and success again supported stage classifications. The PA group made significantly more quit attempts than did the other stage groups and had a larger number of individuals reporting point prevalence abstinence (21%). In addition, almost 80% of the prepared or ready-for-action smokers reported having made a 24-hr quit attempt over the 6 months since recruitment. This is a nonduplicated count of subjects reporting quit attempts at 1 month and 6 months. Contemplators had lower levels of cessation attempts (48%) and point prevalence abstinence (12%). Although these subjects stated at pretest that they were seriously considering quitting smoking in the next 6 months, less than 50% actually made a 24-hr quit attempt, supporting our contention that contemplators can become fixed in place in the contemplation stage, becoming "chronic contemplators." Abstinence at 6 months follows the pattern of cessation. Once again the same pattern of significant differences emerged when outcome was analyzed using the more conservative procedure of counting missing subjects as smokers. These 6-month point prevalence adjusted rates were as follows: PC = 6.0%, C = 9.1%, and PA = 16.2%.

Cessation activity among the groups is more graphically demonstrated in Figures 1 & 2, which plot the percentage of subjects in each group who made a 24-hr quit attempt at 1 and 6 months

Table 4
Standardized Score Comparisons for Processes of Change Across Stages of Change

Processes of change[a]	Precontemplation (n = 166)		Contemplation (n = 794)		Preparation (n = 506)		Tukey comparisons[b]
	M	SD	M	SD	M	SD	
Helping relationships*	47.7	10.2	50.5	9.9	50.0	10.0	PC < C, PA
Consciousness-raising*	44.3	9.8	49.9	9.7	52.1	9.7	PC < C < PA
Self-liberation*	41.9	8.7	48.5	9.1	55.0	9.2	PC < C < PA
Environmental reevaluation*	44.8	8.6	49.8	9.8	52.1	10.0	PC < C < PA
Self reevaluation*	40.6	10.1	50.3	9.4	52.5	9.1	PC < C < PA
Counterconditioning*	46.1	9.0	48.7	9.4	53.3	10.4	PC < C < PA
Reinforcement management*	45.8	8.5	49.3	9.7	52.4	10.3	PC < C < PA
Social liberation	48.6	10.9	50.1	10.1	50.2	9.6	—
Stimulus control*	45.8	6.6	48.8	9.0	53.3	11.3	PC < C < PA
Drmatic relief*	44.7	8.9	50.0	9.7	51.7	10.2	PC < C < PA

Note. All comparisons were made using regression procedures on standardized T scores (M = 50; SD = 10).
[a] The 10 processes by group were analyzed first for overall differences using a multivariate analysis of variance (MANOVA) procedure ($p < .01$).
[b] The standardization sample consisted of all 1,466 smokers in the study. Post hoc comparisons were made using the Tukey procedure. Tukey comparisons that were significant are shown by using a < symbol. If differences were not significant, a comma was used.
* $p < .01$.

or reported point prevalence abstinence at pretest, 1 month, and 6 months. Although this report of the study does not focus on treatment effects, we can report that there were no significant interaction effects between interventions and stage at 1 and 6 months. At 6 months, interventions were continuing, so 12- and 18-month follow-ups are more appropriate measures of treatment outcome. An extensive examination of these results is under way and will be reported in a subsequent publication. Stage effects, however, were dramatic both at 1 month and 6 months. Over the period from 1 month to 6 months, there was a gradual increase in reported cessation activity for each of the three stage groups, with PC, C, and PA groups increasing in the proportion of subjects who stopped smoking in sequential fashion as predicted by the model.

Discussion

This analysis of the stages of change model as applied to these volunteer intervention subjects provides the most comprehensive set of data to test the stage conceptualization of smoking cessation. The results overwhelmingly support the stage categories, Stage × Processes of Change interactions, Stage × Self-Efficacy and Decisional Balance differences, and stage-specific predictions of 1- and 6-month cessation activity. All subjects were smoking as they volunteered for the study and were classified into stages according to intention to quit and previous cessation activity. Stage classifications (PC, C, PA) provided robust subgroups of smokers who clearly were at different points in the process of changing their smoking behavior.

The magnitude and consistency of the results of this study are quite impressive. There was not one instance in which the ordering of the effects was contrary to prediction and previous research. Smokers in different stages of change represented distinct subgroups. At 1 month, 3 times as many contemplators and 7 times as many preparation stage smokers made a 24-hr quit attempt when compared with precontemplators. Point prevalence cessation at 1 month doubled from precontemplation to contemplation and doubled again for preparation stage smokers. These differences continued at 6 months.

Stage effects support our previous research on self-changers (DiClemente & Prochaska, 1985; Prochaska et al., 1988; Prochaska et al., 1990). Stage of change differences allow us to examine microanalytically the process of change with relevance for outcome and process considerations. Our study confirmed and extended these findings to intervention populations. In addition, this study subdivided the contemplation phase into two very different groups of smokers. From previous studies we learned that a recent quit attempt that resulted in relapse could prime the pump for a future quit. In addition, we discovered that there were a group of chronic contemplators who had great difficulty making the actual quit attempt. This study teased these groups apart by subdividing subjects who stated they were seriously considering quitting in the next 6 months by using a more proximal intention to quit and a recent quit attempt. As demonstrated in this study, the distinction is clearly relevant and supports reinstating a preparation stage of change between contemplation and action stages. In previous versions this stage was labeled determination or decision making. However, preparation seems better able to capture the readiness for action of these subjects regarding smoking cessation.

This study demonstrated that movement into the action stage of smoking cessation is not impossible for individuals in each stage of change. A few precontemplators and a significant

Table 5
One-Month and 6-Month Outcome Variable Comparisons Across the Stages of Change

Outcome variables	Precontemplation (PC)	Contemplation (C)	Preparation (PA)	Tukey comparisons
One-month posttest				
n	155	702	444	
Level of manual use (1–5)*				
M	2.8	3.0	3.3	PC < C < PA
SD	1.0	0.9	0.9	
No. quit attempts since contact*				
M	0.2	0.7	1.9	PC < C < PA
SD	1.0	1.6	2.4	
% making quit attempt in last month*	7.7	23.8	55.5	PC < C < PA
% currently not smoking (point prevalence)*	1.9	5.4	13.3	PC, C < PA
% reporting no cigarettes per day average past 7 days	1.3	4.6	8.6	PC, C < PA
Six-month follow-up				
n	127	612	395	
Level of manual use (1–5)				
M	3.1	3.3	3.3	—
SD	0.9	0.8	0.9	
No. quit attempts since last contact*				
M	0.5	1.1	2.6	PC < C < PA
SD	1.2	2.1	2.8	
% currently not smoking (point prevalence)*	7.9	11.8	20.8	PC, C < PA
% making quit attempt over 6 months*	25.6	47.5	79.9	PC < C < PA
% reporting no cigarettes per day average past 7 days*	8.7	10.2	18.0	PC, C < PA

Note. Comparisons were made using regression and post hoc Tukey procedures on continuous data and categorical modeling on dichotomous data. Tukey comparisons that were significant are shown by using a < symbol; if differences were not significant, a comma was used. Sample size for 1-month and 6-month comparisons reflect subjects missing at each follow-up. Linear regression analyses of missing subjects by stage were nonsignificant at both 1 and 6 months. Dash = No significant differences.
* $p < .01$.

greater number of contemplators were able to move ahead and take action to break the smoking habit over the 6-month posttest period. However, PA subjects were closest to action and entered that stage with greater frequency and success. The implications for subject recruitment and selection are enormously important. Studies that use a broad net for recruitment or attempt to treat whole populations could be expected to recruit large numbers of PC and C subjects. Surveys of worksite populations have found large numbers of subjects in PC and C stages (Biener et al., 1988). Outcome effects would vary greatly depending on the various stages of subjects recruited. Studies that recruited subjects from the PA stage would be able to demonstrate a greater effect size than studies that had subjects from all these stages or predominantly from C or PC stages.

Reported 6-month quit rates for various types of smoking cessation programs can vary dramatically (USDHHS, 1989). In this report the median 6-month quit rate for 11 self-help trials was 17% and for 15 group therapy trials was 24%. Cohen and colleagues (1989) reported quit rates from a number of self-change and minimal intervention studies. The median 6-month point prevalence abstinence rate was 13.2%. Point prevalence rates in this study were quite comparable. Collapsing across groups, 6-month point prevalence abstinence for all subjects in this study counting missing subjects as smoking was 11.2%. Because we recruited early stage smokers, had a heavy-smoking group (M = 27 cigarettes per day), and offered minimal interventions, these figures appear comparable to other studies. However, the dramatic stage differences in rates supports the contention that variation in cessation rates among programs and studies may have more to do with differences in smoker selection than in treatment methods themselves (Cohen et al., 1989).

The stages of change provide a substantial challenge for intervention development. Intensity, duration and type of intervention should be responsive to the stage of change of the client. Later stage subjects may benefit from more intense, shorter, action-oriented types of interventions. Subjects earlier in the process of change may need less intense and more extensive types of programs to be able to follow them through a quitting cycle and move them to successful action. It is clear that one

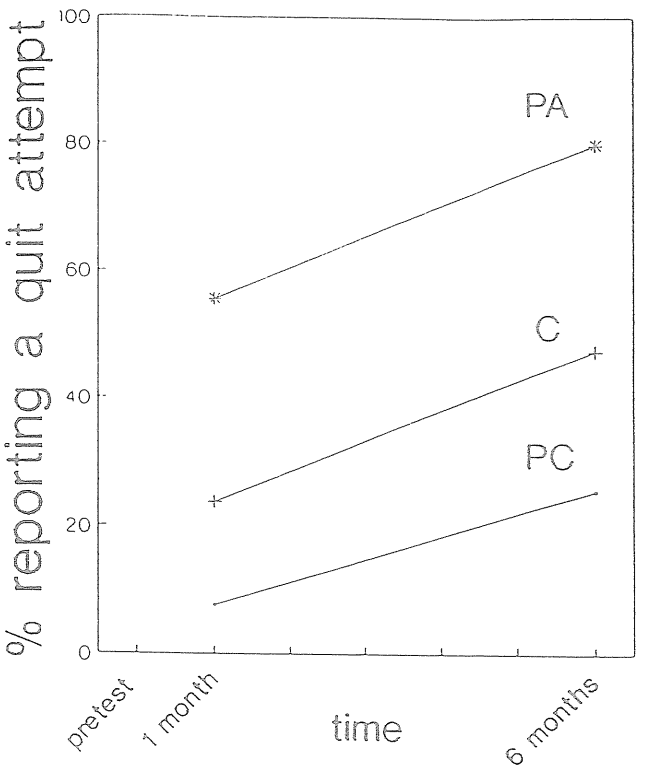

Figure 1. Percentage of subjects reporting quit attempts during follow-up periods by stage of change.

and not biochemically validated. A minimal bogus pipeline effect was used and could be expected to increase validity. In addition, cessation activity results are certainly in line with other studies. Subjects were specifically recruited from all stages for this study. Thus results may not be comparable to studies that make entry into a study more arduous or that specifically recruit preparation subjects. Our intention was to attract even subjects who were not currently wanting to quit. Even so, we expect that we recruited precontemplators who may have been more amenable to hearing nonsmoking messages. Precontemplators who are completely resistant to any cessation related activity (USDHHS, 1988) were not represented in this study.

We have limited the results of this study to the first 6 months after recruitment. This was done intentionally. We focused on short-term cessation activity, not long-term abstinence. As such, this was an action not a maintenance study. Inasmuch as the stage classification schema used a 6-month framework, the 6-month period seemed most appropriate to assess the outcome for pretest stage categories. Once assessments go beyond 6 months, outcome becomes moderated by shifts in stage. Because this is a dynamic model, stage movement can occur at any time. Even for our study, shifts in stage (e.g., from PC to C) were occurring for these subjects. Extending a pretest stage categorization analysis beyond the 6-month outcome seemed unreasonable without adding stage movement. This would complicate the present report. Measuring movement through the stages will be the focus of another analysis from our study.

into action, all subjects need strategies to sustain cessation long term. Population-based interventions could profitably take these differences into account in order to develop carefully orchestrated and conceptually sound packages of techniques, messages, and channels of delivery. Some of our current population-based projects involve more proactive strategies to reach precontemplators, serial interventions, stepped care types of programs, and targeted interventions attempting to maximize special cessation opportunities. At the level of the individual, cessation interventions may be able to increase success rates by being sensitive to stage and by shifting strategies depending on stage of change. For early stage smokers, repeated contacts seem essential. Feedback that focuses on stage-specific goals and strategies holds great promise. However, maintaining contact with individuals as they move through the cycle of change over time can be the greatest challenge. Paying attention to the stages of change dimension should help increase the effectiveness and efficiency of our interventions.

The interrelationship of the stages and the processes of change provide avenues for significant new research. Programs can be examined not only for the outcomes they produce but for the processes they engender. Significant differences among stage subgroups on most processes of change coincide with previous findings of process fluctuation across the stages of change (Prochaska et al., 1990). Programs need to be designed and evaluated on the basis of these Process × Stage patterns.

Several cautions are needed regarding this study and the results reported. Cessation figures noted were self-reported ones

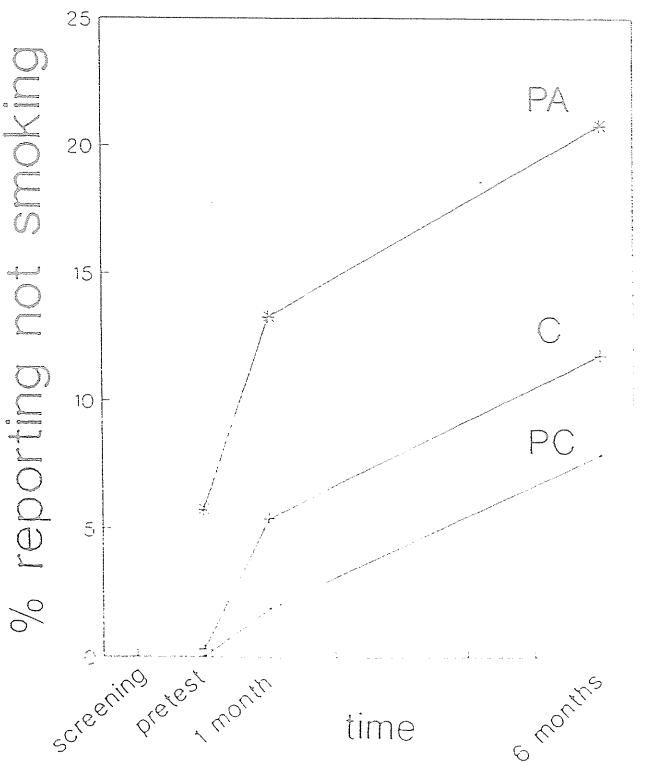

Figure 2. Percentage of subjects reporting nonsmoking prevalence by stage of change over time.

The stages of change model provides a valuable and intriguing view of the process of change for smoking cessation. The current research strongly supports the contention of the transtheoretical model that stages and processes of change are the basic building blocks of the process of change. Implications for assessment, recruitment, intervention, and research are only beginning to be understood.

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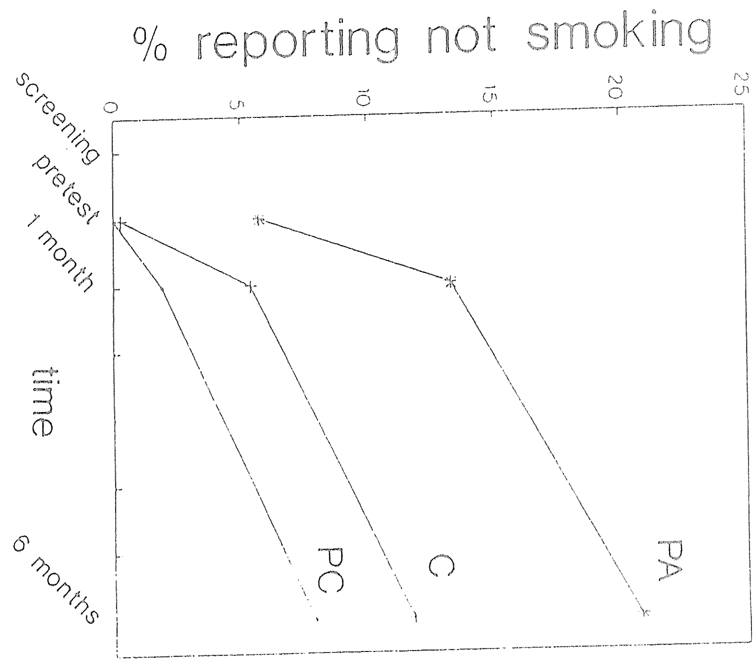
% reporting a quit attempt
100
80
60
40
20
0
pretest
1 month
time
6 months
PA
C
PC


% reporting not smoking
0
5
10
15
20
25
screening
pretest
1 month
time
6 months
PA
C
PC