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Xiaowa Sun
University of Rhode Island

James O. Prochaska
University of Rhode Island, joprochaska@uri.edu

See next page for additional authors

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Authors
Xiaowa Sun, James O. Prochaska, Wayne F. Velicer, and Robert G. Laforge

Transtheoretical Principles and Processes for Quitting Smoking: A 24-Month Comparison of a Representative Sample of Quitters, Relapsers, and Non-Quitters

Xiaowa Sun, Ph.D., **James O. Prochaska, Ph.D.**, **Wayne F. Velicer, Ph.D.**, and **Robert G. Laforge, Sc.D.**
Cancer Prevention Research Center, University of Rhode Island

Abstract

This longitudinal study compared 14 principles and processes of change applied by successful quitters, relapsers and non-quitters over 24 months in a representative sample of 4,144 smokers in intervention and control groups. The successful quitters showed a decrease in the use of experiential processes (cognitive, affective and effective) and an increase in behavioral processes (e.g., counter-conditioning and stimulus control). The non-quitters showed little change in their use of almost all of the processes. The relapsers' use of the processes tended to initially parallel the successful quitters, but over time, their use ended up between the quitters and the non-quitters. In general, the relapsers ended up working harder but not smarter than the successful quitters. The pattern of use of change processes in the treatment and control groups were remarkably similar, suggesting common pathways to change.

Keywords

Stages of Change; Smoking Cessation; Patterns of Change; Relapse

Of the people alive in the world today, about 500,000,000 are expected to die from the use of tobacco (Peto & Doll, 1990). They will lose about five billion years of life. Given the incredible consequences of tobacco use, it is imperative that behavior science develops treatments that can maximize impacts on entire populations of smokers. This study reports what was learned about the principles and processes for quitting smoking in a population of 4,144 smokers who participated in a program that produced unprecedented impacts on smoking.

The vast majority of smoking cessation research has focused on the efficacy of alternative interventions (Fiore et al., 1996; 2000). Efficacy is typically measured as the percentage of smokers abstinent at a particular point in long-term follow-up. Most of the interventions tested have been action-oriented and smokers have been screened for their readiness to quit, such as the next week or month (e.g., Zhu et al., 1995; Fiore et al., 1996; 2000). The major limitation of these studies is that they are designed for the relatively small percentage of smokers who are prepared to quit (Velicer et al., 1995). When these evidence-based interventions are disseminated they reach very few smokers. When managed care organizations offer such

action-oriented interventions for free, removing cost as a barrier, the percentage of smokers who participate in a year nationally is only about 1% (Lichtenstein and Hollis, 1992). Similarly, when the best action-oriented free quit lines are made available by state departments of health, most states have to budget for less than 1% of smokers participating. Such cessation programs can produce only minimal impacts on the problem. Impact equals efficacy rates times participation rates (Velicer & Prochaska, 1999). Given that the best programs produce 25% to 30% abstinence at long-term follow-up, their impacts will only be a fraction of a percent.

Besides their practical limitations, such research also provides little knowledge about principles and processes of quitting smoking that are applied on a population basis. To counter these limitations, our center developed a program of research on population approaches to smoking cessation (Velicer et al., 2006). In our first project, we were able to recruit about 80% of a representative population of smokers. In this population, less than 20% of the smokers were in the preparation stage of change and were prepared to quit in the next month, 40% were in the contemplation stage, and 40% were in precontemplation. With more than 80% of the smokers not ready to quit, we produced about 25% abstinence at 24-month follow-up with our best practice of computer-based, expert systems designed to help smokers progress through the stages of change (Prochaska et al., 2001a). As far as we know, these outcomes represent unprecedented impacts on a population of smokers.

The impacts of our best practice were replicated in a population of 4,500 smokers from a managed care organization in which 85% of the eligible smokers were recruited (Prochaska et al., 2001b). In a population of adolescent smokers in primary care 65% were recruited and the long-term abstinence rates (23.9%) in the treatment group using our best practice was significant and very similar to the rates in adults (Hollis et al., 2005). In a population of depressed smokers, the abstinence rates (24.6%) were also similar in the treatment group receiving our stage-matched tailored treatment plus counseling and NRT (Hall et al., in press).

Similar abstinence rates were produced even when we effectively treated these three behaviors (smoking, diet and sun-exposure) in a population of 2,460 parents of teenagers participating in health promotion programs at school (Prochaska et al., 2004). Similar abstinence rates (25.4%) were also produced when we effectively treated four behaviors (smoking, diet, sun-exposure and mammography screening) in a population of 5,500 primary care patients (Prochaska et al., 2005).

We have also tried to increase the efficacy of the program from 25% to 30% abstinence by doubling the number of therapeutic contacts from 3 to 6 (Velicer et al., 1999), adding four proactive telephone counseling sessions (Prochaska et al., 2001b), adding a nicotine fading program delivered by a Personal Digital Assistant (Prochaska et al., 2001b) and adding nicotine replacement therapy (Velicer et al., 2006). None of these therapeutic enhancements increased efficacy and some, like the PDA, actually made things worse (Prochaska et al., 2001b). To produce the next breakthrough in population cessation, more basic knowledge is needed about the principles and processes of change that populations apply to quit smoking. Fortunately, our initial population trial was designed to assess not only outcomes, but also principles and processes of change applied by both treatment and control groups over the course of a 24-month follow-up.

One of the ways to increase our understanding of how change occurs is to study the pattern of change over time. This study compared three types of smokers, based on their patterns of change over time: those who were not quit at any of the six month follow-ups over a 24 month period; those who were quit at one of the six month follow-ups and at each subsequent follow-up; and those who were quit at one of the six month follow-ups but had relapsed by the 24

month follow-up. This study applied a relatively unique exploratory data analysis methodology called *dynamic typology* which groups participants by their pattern of dynamic changes over time (Prochaska et al., 1990; Norman et al, 1998). In this case, three types of dynamic patterns were compared: (1) Stable smoking over time; (2) Stable quitting over time; and (3) Unstable quitting followed by relapse. These three dynatypes were compared for both the treatment and control groups. Comparing these groups on 13 principles and processes of change was designed to provide basic knowledge that could be used to help stable smokers to quit and to help unstable quitters to remain quit.

Method

Sample

This study began with a representative sample of 4,144 smokers proactively recruited in Rhode Island by random digit dialing procedures. Of these smokers 42.1% were in the precontemplation stage and were not intending to quit smoking in the next six months; 40.3% were in the contemplation stage and were intending to quit in the next six months and 17.6% were in the preparation stage and were intending to quit in the next month and had quit for at least 24 hours in the past year. They smoked a mean of 20.6 cigarettes per day (S.D. = 10.). About one-third of the smokers (n = 1358) were randomly assigned to the treatment group and about two-thirds to the assessment only group (n = 2786). The treatment group were mailed tailored expert system intervention materials at baseline, 3 and 6 months. All subjects were proactively assessed at six month intervals for 24 months.

Over the 24 months 3,163 of the participants were Stable Smokers, 695 were Stable Quitters and 286 were Relapsers. Table 1 presents demographic and addiction variables for these three dynatypes. The three groups had similar demographics and were primarily non-Hispanic Caucasian high school graduates with a mean age of about 40 and a little over 50% were married. Even though this was an RDD sample there were somewhat more females (about 55% total) than males, with the biggest difference in the Stable Quitter group.

There were no significant differences between the groups on any of the demographic variables. There were significant differences on number of cigarettes per day and time to first cigarette, with the Stable Smokers showing higher addiction on these variables than the Stable Quitters and Relapsers who did not differ.

Measures

Decisional Balance inventory—The Decisional Balance inventory was initially developed to test a multidimensional (eight factors) schema proposed by Janis and Mann (1977) for representing both the cognitive and motivational aspects of human decision making. Velicer et al. (1985) constructed a 24-item inventory to measure decision making as it might be applied to smoking. The resulting psychometric analyses of the original 24-item inventory revealed two (as opposed to the posited eight) subscales that were labeled the Pros of Smoking and the Cons of Smoking. For the purposes of this study, as part of the effort to reduce response burden, a six-item short form version (Fava et al., 1991; Ward et al., 2004) was developed. Correlations between the three-item short form scales and the original length scales were .88 for both the Pros and the Cons. The short-form structure was confirmed on an independent sample using structural equation modeling to perform a confirmatory factor analysis (CFA) on the same selected six items using a sample of 870 smokers who had taken part in a smoking cessation intervention study. Summary fit indices were excellent (above .90) and included Joreskog and Sorbom's (1989) Goodness of Fit Index (GFI = .995), Tucker and Lewis's (1973) Index (TLI = .989), and Bollen's (1989) Delta Fit Index Type 2 (DELTA = .994).

Processes of Change—The processes are covert or overt activities that individuals (e.g., therapists, clients, or self-changers) use to modify problem behaviors. The Processes of Change Questionnaire (Prochaska et al., 1988) measures ten processes of change in a statistically well-defined and highly reliable manner. Table 2 presents the ten processes of change and a sample item. In the version used here, subjects respond to each item on a five-point Likert scale of current frequency of use in the past month (1 = never; 3 = occasionally; 5 = repeatedly).

A confirmatory analysis (LISREL) supported the 10-process measurement model (Prochaska et al., 1988). In addition, two-second order factors were included in the model. The first general factor was labeled *experiential* because it combined five processes that are cognitive, affective or evaluative in nature. This factor was interpreted as reflecting a tendency to use more than one of these five processes at the same time. However, the use of the processes is still relatively independent. The second general factor was labeled *behavioral* because it combined five processes that have been found to be more action related. The 20-time short-form version (Fava et al., 1991) of this inventory was used. Alpha coefficients were considered good to excellent for two-item scales and ranged from .67 to .90 with a mean of .80. Correlation between the two-item short form scales and the original four-item scales ranged from .87 to .96. The short form structure was confirmed on an independent sample using structural equation modeling to perform a confirmatory factor analysis (CFA) on the same selected 20 items using a sample of 870 smokers who had taken part in a smoking cessation intervention study. Summary fit indices were excellent (above 90) and included Joreskog and Sorbom's (1989) Goodness of Fit Index (GFI = .941), Tucker and Lewis's (1973) Index (TLI = .932), and Bollen's 1989) Delta 2 Fit Index Type 2 (DELTA = .943).

Situational Temptations Inventory—The Situational Temptation inventory (DiClemente et al., 1985: Velicer et al, 1990) as a 31-item measure of cue strength and paralleled a measure of self-efficacy or confidence that was developed concurrently. Further psychometric analysis of the original inventory revealed that there was a second order or hierarchical structure with three first order factors or dimensions of tempting smoking situations: Positive/Social, Negative/Affective, and Habit/Addictive (Velicer et al., 1990). The effort to reduce response burden on current study participants necessitated development of a nine-item short-form version (Fava et al., 1991). Correlations between the three-item short-form scales and the original-length scales were .97 for the Positive/Social subscale, .98 for the Negative/Affective subscale, and .91 for the Habit Addictive subscale. The short-form structure was confirmed using structural equation modeling to perform a confirmatory factor analysis (CFA) on the same selected nine items using the sample of 870 smokers who had taken part in the smoking cessation intervention study. Summary fit indices were excellent (above .90) and included Joreskog and Sorbom's (1989) Goodness of Fit Index (GFI = .976), Tucker and Lewis's (1973) Index (TLI = .971), and Bollen's (1989) Delta2 Fit Index Type 2 (DELTA = .981).

Biochemical Validation

State of the art research has required many smoking cessation researchers to rely on costly biochemical validation of tobacco use. We do not believe it is necessary to use an expensive biochemical validation in this study for the following reasons: (1) Even the most popular and reliable measure, cotinine, is only appropriate for validating 24 to 48 hours point prevalence abstinence measures (Velicer, Prochaska, Rossi & Snow, 1992). However, the use of 7 to 10 day point prevalence or prolonged abstinence measures is preferable. (2) The amount of adult subjects who report that they are not currently smoking, yet test positive for cotinine is about 2%, with the exception of high-demand interventions, such as smoking clinics. (3) Mis-reporting would not obscure group differences, unless it approached 50%, an unheard of finding. We published an extensive review of the literature in the area of biochemical validation (Velicer et. al, 1992) and concluded that it was inappropriate for low demand studies such as

the proposed study. Three subsequent studies have appeared that strongly support our conclusions (COMMIT, 1995; Glasgow, et al., 1993; Patrick, et al., 1994). Recently, the Society for Research on Nicotine and Tobacco published a consensus statement that supported this same position (Benowitz et al., 2002).

Intervention

This condition represents our best practice for smoking cessation, since it has replicated consistently across a series of populations. This treatment was tailored on three occasions (baseline, 3, and 6 months) on each of the 14 TTM variables. This treatment provided both normative and ipsative feedback on each of the variables found to predict progress across specific stages. At baseline, there were 204 potential unique reports and at each follow-up, the number grew to 14,912 (Velicer & Prochaska, 1999). Each report was 4 pages long with the first section of the report focused on stage, the second on decisional balance and situational temptations, the third section focused on processes of change most relevant to progress to the next stage and the fourth on strategies to progress to the next stage. The report ended by referring participants to the self-help manual that was mailed to them at baseline.

Analytic Plan

Data analysis methods span the range from exploratory to confirmatory. Exploratory procedures (Behrens, & Ho Yu, 2003; Tukey, 1977) are primarily hypothesis generating while confirmatory procedures are primarily hypothesis testing. The focus of exploratory procedures is typically on *revelation* or the graphic representation of the data (Wainer, & Velleman, 2001). Cluster analysis is an example of a method that is primarily exploratory. The present research will focus on identifying dynatypes, i.e., groups of homogenous individuals on the basis of their pattern of change over time (Norman, Velicer, Fava, & Prochaska, 1998). The dynatypes will then be related to changes in 13 dynamic variables over time. These validating variables were assessed on five occasions over a 24-month period and will be converted to standard score (T score) form to permit comparisons across variables. The means across time for each dynatype will be plotted for each of 13 TTM variables for the dynatypes. The resulting graphs indicate whether each of the six groups increased, decreased, remained stable or variable in their application of each of the 13 TTM variables over the two-year period. The graphs also indicate how much of a standard deviation the six groups increased or decreased in their application of each TTM variable and compared the six groups on how much of a standard deviation they differed over the five assessment points.

In previous exploratory research on cross-sectional patterns of relationships between processes of change and stages of change (Prochaska & DiClemente, 1983) and pros and cons of changing and stages of change (Prochaska et al., 1994), the data were primarily represented graphically. These two studies have been two of the top 14 most cited articles out of nearly 10,000 studies related to smoking cessation and tobacco control (Byrne & Chapman, 2005). These results indicate how exploratory research relying on descriptive graphical representation of data can be high-impact research. As in the past, future studies will follow this exploratory research with confirmatory research employing the same behavior as this study and then generalized to other behaviors.

Results

Quit Rates and Relapse Rates

Table 3 shows the 24 hour point prevalence abstinence rates for the expert system intervention group and the assessment only group at 6, 12, 18 and 24 months. These outcome data were reported previously (Prochaska et al., 2001a). The expert system intervention produced significantly more abstinence at each follow-up than the assessment only group with the

differences between the two groups becoming significantly greater over the course of follow-up. The continued increases in quit rates long after the expert system intervention ended may have been due to the continued availability of the stage-matched manual which treatment participants could apply on their own.

Table 3 also presents the relapse rates for the two groups at 12, 18 and 24 months. The relapse rates at 12 months were for those who were quit at 6 months and the relapse rates at 18 months were for those who were quit at 12 months. The expert system intervention produced significantly less relapse at each follow-up. For both groups the relapse rate at 24 months was significantly lower than 18 months as more stable quitters were accumulating.

Decisional Balance

Figure 1 presents the patterns that emerged over 24 months for the importance of the pros of smoking for the three dynatypes in both the intervention and control conditions. The Pros of Smoking increased linearly about .20 S.D. in each of the Stable Smokers groups and decreased linearly about 6.0 S.D. in the two Stable Quitters groups. The two relapse groups decreased linearly about .20 to .40 S.D. over the first 12 months and then increased about .20 S.D. over the next twelve months.

Figure 2 presents the 24 month pattern for the importance of the Cons of Smoking for each of the six groups. The Cons increased about .30 S.D. over 24 months for the two groups of Stable Smokers. The Cons decreased about .30 to .40 S.D. over 24 months for the two groups of Stable Quitters. For the two Relapse groups the Cons decreased about .20 S.D. over the first 12 months and increased about .40 S.D. over the next 12 months.

Figure 3 presents the 24 month patterns for the decisional balance (pros minus cons of smoking) for each of the six groups. The decisional balance score was noticeably higher at baseline (about .20 S.D.) for the two Stable Smokers groups and remained higher at each follow-up. For all six groups the decisional balance scores remained relatively stable over time with average decline of about .10 S.D.

Experiential Processes of Change

Consciousness Raising—As shown in Figure 4, the frequency of using consciousness raising decreased over 24 months for all six groups with the Stable Quitters showing the most decrease (about .50 S.D) and Stable Smokers showing the least (.10 to .20 S.D.).

Dramatic Relief—Relapsers in the control group showed noticeably higher use of dramatic relief over time followed by relapsers in the intervention group (Figure 5). Stable smokers showed on average the least amount of use of this process with little change over time. Stable Quitters followed somewhat of a curvilinear pattern with initial increases in dramatic relief followed by decreases.

Self-Reevaluation—Stable Quitters in both groups showed a fairly linear decrease in their use of self-reevaluation of about .50 S.D. (Figure 6). Both groups of relapsers remained at the relatively high end of use of self-reevaluation over time. Stable smokers are fairly stable in their use of self-reevaluation with an increase of about .10 S.D.

Environmental Reevaluation—Relapsers on average showed the highest use of environmental reevaluation over time and Stable Smokers on an average showed the lowest use (Figure 7). A curvilinear pattern is evident for most groups with declines at six-months, increases to 18-months, and mixed patterns at 24-months.

Social Liberation—Stable smokers in both groups show linear increases in social liberation of about .40 S.D. over the 24 months (Figure 8). Relapsers showed similar increases of about .20 to .30 S.D. over 24 months. Stable quitters ended up using social liberation less than the other groups (about .20 to .50 S.D. less) at 24 months.

Behavioral Processes of Change

Counter-conditioning—Stable Smokers in both conditions used counter-conditioning noticeably less than the other groups and were remarkably stable in their use over 24 months (Figure 9). Both groups of Stable Quitters, on the other hand, increased about .80 S.D. in their reliance on counter-conditioning over 24 months. Relapsers in the two conditions paralleled the Stable Quitters in increased use over the first 12 months (about .50 to .60 S.D.) but then decreased about the same amount over the last 12 months.

Stimulus Control—As reflected in Figure 10, Stable Smokers showed on average the least use of stimulus control over the months but they did increase in their use of this process (about .20 to .40 S.D.). Stable Quitters also increased in their use of stimulus control over time with about .40 S.D. increases in the first 12 months, followed by a small decrease (.10 S.D.) at 18 months and another increase of .20 to .30 S.D. at 24 months. The relapsers essentially paralleled the Stable Quitters over 18 months but then they decreased about .10 to .20 S.D. at 24 months.

Reinforcement Management—Use of this process varied the most between intervention and control conditions (Figure 1). Stable Smokers, for example, started out using this process the least, but the intervention group increased their use by about .30 S.D. and at 24 month used reinforcement management the most. The control group of Stable Smokers used this process the least over time and increased by about .10 S.D. Stable Quitters in the intervention group increased their use of reinforcement management by about .20 S.D. while the control group showed little variation in use over time. Relapsers in the intervention group increased their use by about .25 S.D. over the first 12 months and then decreased by about .20 S.D. over the next 12 months. The control group of Relapsers used this process at higher levels over most of the 24 months.

Helping Relationship—Stable Quitters decreased in their use of helping relationship by about .30 to .40 S.D. over 24 months (Figure 12). Stable Smokers were relatively stable in their use of this process, showing at most about .10 S.D. decrease over 24 months. On average the two relapse groups used helping relationships the most over the 24 months while evidencing a curvilinear pattern of small decreases at 6 months and again at 24 months.

Self-Liberation—Stable Smokers in both groups showed the least amount of use with little change over the 24 months (Figure 13). Relapsers on average showed the most use of self-liberation over time with a curvilinear patter of increasing over the first 12 months about .30 to .40 S.D. and decreasing by about the same amount over the last 12 months. Stable Quitters showed small initial increases at 6 or 12 months and then leveled off or decreased somewhat to 24 months.

Situational Temptation—Figure 14 presents the patterns that emerged over 24 months for the intensity of temptation for the Stable Smokers, Stable Quitters and relapsers in both the intervention and control groups. The intensity of temptation is displayed as a T-score (Mean = 50, S.D. = 10) based on the mean and standard deviation of all subjects at baseline. Temptation levels remained remarkably stable at each follow up for Stable Smokers in both groups. Temptation levels showed a linear decrease of about two standard deviations over the 24 months for both groups of Stable Quitters. For the two groups of Relapsers the temptation levels decreased linearly about one standard deviation over the first 12 months and then

increased about .50 S.D. over the next 12 months. The patterns of change for each for the three Temptation subscales were essentially identical to the total score and are not presented here.

Comparing Groups Across the 14 Variables

At baseline, the Stable Smokers were using 12 of the 14 change variables less effectively than the other four groups. On the other two variables (Consciousness Raising and Social Liberation) they were using them less effectively than three of the four groups. The mean difference in less effective use of the variables was small (.17 S.D.), but highly consistent.

Compared to the Stable Quitters' use of the 14 variables over the 24 months, the Stable Smokers demonstrated practically no change in effective use of the variables with a mean of -.04 S.D. and a range from -.30 on the Cons to +.20 on Social Liberation. The Stable Quitters, on the other hand, had a mean increase in effective use of +.40 S.D., with a range from .05 on Social Liberation to 1.8 on Temptations.

Discussion

Graphic analyses of dynamic typologies have in the past served as a foundation for building expert system interventions that have proven to be remarkably robust in population cessation trials. In the past such analyses focused on a population of self-changers and compared the use of principles and processes of change of stable groups that remained in the same stage of change over 24 months, those who regressed one stage or more and those who recycled through the stages of change (Prochaska et al., 1990). The hope is that the current analyses of Stable Quitters, Relapsers and Stable Smokers from a representative sample of treated and control smokers can provide guidance that can lead to breakthroughs in our current best practices for population cessation. But these are complex patterns that first need to be summarized to see what they reveal about each of the three dynatypes.

Relapsers

We begin with the relapse pattern because this has been seen as the biggest challenge facing those who intervene with addictive behaviors. Relapse prevention has been one of the most common programs of research that have applied behavioral, biological and/or social interventions to prevent relapse. It is not clear whether any innovations have produced consistent improvements in relapse prevention, particularly on a population basis. Future innovation could be based on what the two groups of relapsers from a population cessation trial reveal about their use over time of key principles and processes of change.

Across ten processes of change and over 24 months, the relapsers on average were using five of the processes the most: dramatic relief, self-reevaluation, environmental reevaluation, helping relationship, and self-liberation. These data alone suggest that relapse may not be due to these smokers not working hard enough. If working harder is related to motivation then relapse may not be due to insufficient motivation. Our speculation is that smokers who relapse and/or recycle may lack adequate preparation for effective cessation.

Compared to Stable Quitters, Relapsers do not decrease their reliance on self-reevaluation and relapsers do not continue to increase over time their reliance on stimulus control and counter conditioning. Similarly, compared to Stable Quitters, the Relapsers fail to continue to lower their evaluations of both the Pros and Cons of smoking and their overall Temptations to smoke.

Overall, Relapsers present a picture that could be characterized as an eclectic trial and error approach in which behavior change is attempted by trying harder with all types of change processes and principles but not knowing which processes and principles to decrease over time and which ones to increase over time. In brief, we believe that relapsers need to be helped to

work smarter rather than working harder. One of the promising approaches would be to provide expert guidance on how they could continue to parallel the Stable Quitter's use of change principles and processes over the long-term.

Stable Quitters

The successful quitters did not just keep working harder over time. They decreased their reliance on some of the experiential change variables like decision-making variables, consciousness raising and self-reevaluation. They increased their reliance on some of the behavioral change variables like counter-conditioning and stimulus control. With some of the processes like self-liberation, dramatic relief and reinforcement management their reliance remained relatively consistent over time. This group reflected the most dynamic and differentiated use of the 14 change variables.

What is also noteworthy is that successful quitters in both the intervention and control groups revealed very similar patterns in the use of change principles and processes over time. Even though a growing series of studies have demonstrated that the stage-matched intervention produced significantly more abstinence, the present results indicate that the successful quitters in both the intervention and control groups followed common pathways to change. Such common pathways to change could provide answers to one of the most important questions in comparative psychotherapy research: How can very different therapies like CBT, motivational interviewing and 12-step treatments in Project Match (1997), produce very common outcomes? The answer might well be that successful changes in different treatments and in control groups apply principles and processes of change in very similar ways.

Stable Smokers

The Stable Smokers were by far the largest group, representing about 75% of the representative sample. Their sheer size suggests their potential for intervention breakthroughs in the future. Unfortunately, the Stable Smokers function in some ways like black holes. They do not emit much light from which we can learn. Their very stability results in few signals about behavior change. Compared to the Stable Quitters use of the 14 variables over 24 months, the Stable Smokers demonstrated practically no change in effective use of these variables with a mean change of only -.04 S.D. Their biggest changes were generally in a negative direction away from the Stable Quitter group, such as on the pros and cons of changing, temptations and social liberation.

The most positive increases with the Stable Smokers were with Reinforcement management (+.20 S.D.) and Stimulus Control (+.20 S.D.). These results suggest that over time their smoking may be moving somewhat more under the control of environmental situations and that they might be reinforced by others on occasions when they do not smoke. The overall pattern for these groups, however, is stability with little evidence that they are using change variables in ways that are likely to lead to quitting.

Relapse Prevention is not the Only Challenge

The data in this study have caused us to question the major strategies we have been applying for more than a decade to produce a breakthrough in our best practice for population cessation. This strategy has been essentially relapse prevention based on clinical interventions. To our best practice of three tailored communications we have added evidence-based interventions like nicotine replacement (Velicer et al., 2006), nicotine fading (Prochaska et al., 2001b), proactive telephone counselor calls (Prochaska et al., 2001b) and a more intensive treatment with a doubling of the number of sessions (Velicer et al., 1999). All of these approaches failed to produce a breakthrough from about 25% abstinence to 30%.

The data in this study suggests that a breakthrough of just a five percentage point increase in abstinence at long term follow-up would be difficult to produce via relapse prevention in our treatment group of relapsers. To produce five percent more quitters in the treatment group would require 68 more quitters at 24 month follow-up (5% of the 1358 smokers in the treatment group). This seems like a rather modest increase to achieve in such a large treatment group. But to have the 68 additional quitters come from preventing relapse in the 87 relapsers would require a monumental accomplishment of preventing relapse with 78% of the relapsers (68/87 = 78%).

In treatment populations with much higher proportions of relapsers, innovative relapse prevention may be amore feasible way to produce a breakthrough. One of the advantages that relapsers have is that they have progressed further through the stages of change than Stable Smokers. Also, they apply processes of change more intensely. But, in a representative sample of smokers, like in the present study, Relapsers may constitute relatively small percentages of the total treatment group.

If in such populations relapse prevention is not likely to produce the breakthrough of 5% more quitters in the treated population, where would the breakthrough be more likely to occur? Since the Stable Smokers represent the large majority of this representative population over time, producing 68 additional quitters would require success with only 6.7% of the 1022 Stable Smokers.

Fortunately the data also indicated that we can identify at baseline those who are most likely to be Stable Smokers. As a group, they smoked about 4.5 cigarettes more per day and smoked their first cigarette about 30 minutes earlier than Stable Quitters and 45 minutes earlier than Relapsers. Also, they consistently score worse on each of the 14 change variables at baseline. While the mean difference is small (-.17 S.D.), it suggests an intervention strategy that could be used in future research.

Future Research

One strategy would be to identify those who are likely to be Stable Smokers and tailor interventions to their special needs and challenges. The long term goal would be to help this Stable Group take action over time. The finding that their mean difference in their effective use of the 14 change variables is only -.17 S.D. is encouraging, since this is a small effect size. The immediate intervention goal would be to increase their effective use of the change variables by only about .20 S.D., which should be achievable. Such improvement would help this group to have a pattern of use that would be comparable to the Stable Quitters and Relapsers. The assumption is that the more the Stable Smokers model early in treatment the groups who took action over time, the more likely this group would also take action over time. Some of them would relapse, but if they followed the pattern in this study, the majority who took action would become Stable Quitters.

Another strategy would be to apply interventions with the Stable Smokers that have been found to produce significant action in populations of unmotivated smokers. Carpenter et al. (2004) found with a large sample of smokers in precontemplation and contemplation, that 23% were abstinent at 6 months following five sessions of motivational interviewing delivered by telephone. This was significantly greater than the 4% in the control group. They also found that in a third treatment group, that smoking reduction counseling utilizing NRT produced 18% abstinence at 6 months.

A third strategy is to guide relapsers, including those from the Stable Smoker group who are helped to take action, to work smarter rather than harder. Providing expert guidance could help

those who are at risk of relapsing to parallel the Stable Quitters use of change principles and processes over the long term.

Future research can compare these alternative approaches to helping unmotivated smokers who are most likely to remain Stable Smokers or to become Relapsers. Combining these promising strategies with our current best practice of tailored interventions could finally produce significant impacts in population cessation.

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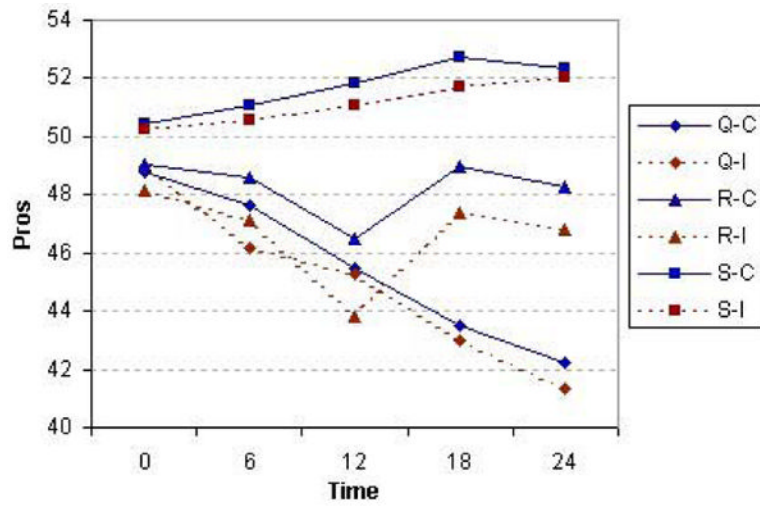
Figure 1.
Patterns of change over 24 mo. for Pros for the Stable Smokers (S), Stable Quitters (Q), and Relapsers (R) in both the intervention (I) and control (C) groups.
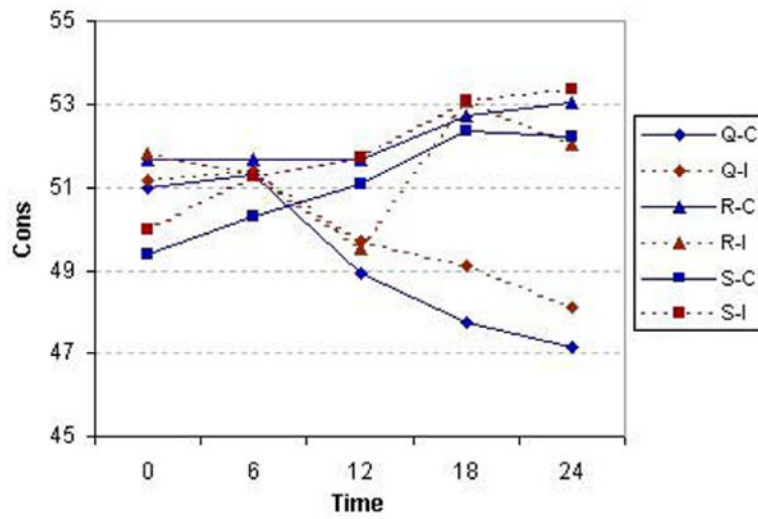
Figure 2.
Patterns of change over 24 mo. for Cons for the Stable Smokers (S), Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups
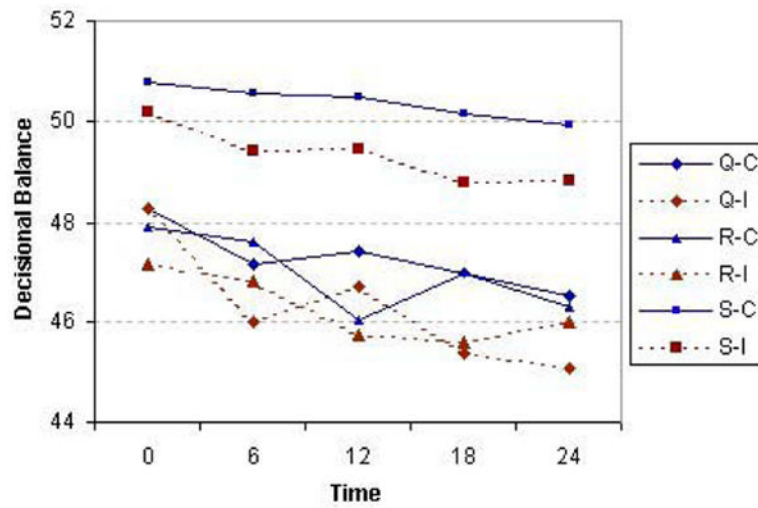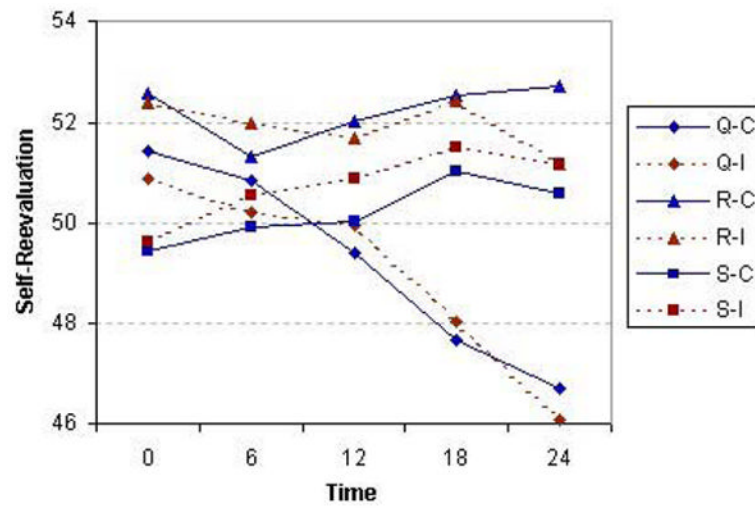
Figure 3.
Patterns of change over 24 mo. for Decisional Balance (Pros-Cons) for the Stable Smokers (S),
Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups
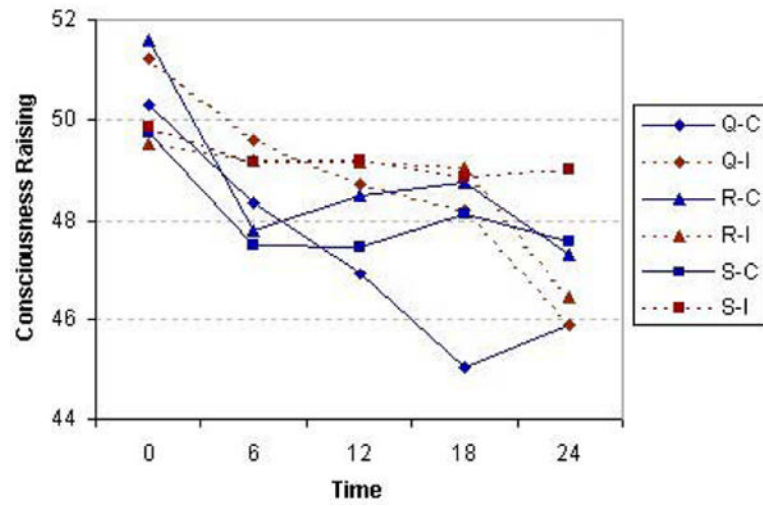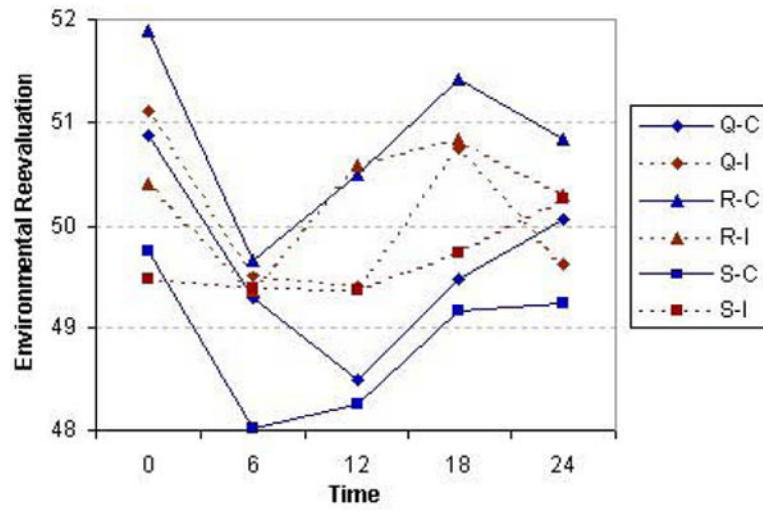
Figure 4.
Patterns of change over 24 mo. for Consciousness Raising for the Stable Smokers (S), Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups
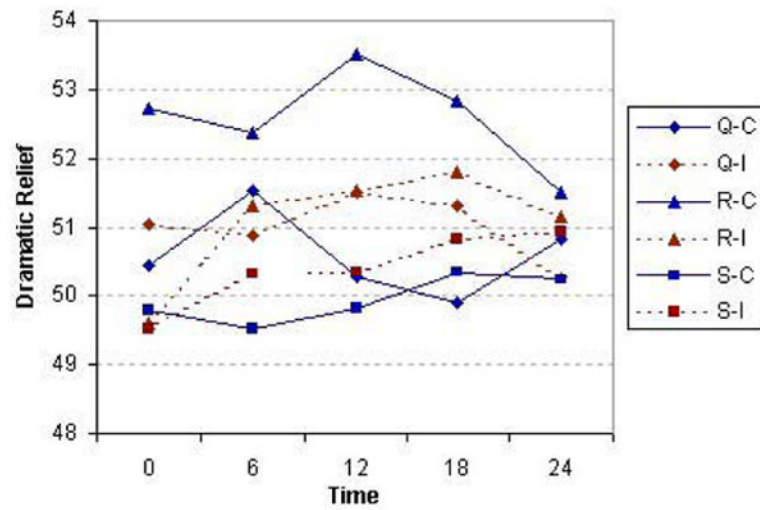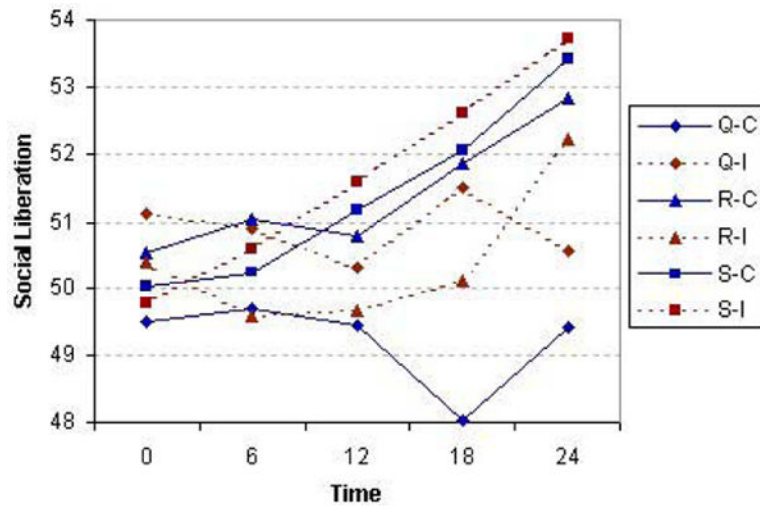
Figure 5.
Patterns of change over 24 mo. for Dramatic Relief for the Stable Smokers (S), Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups
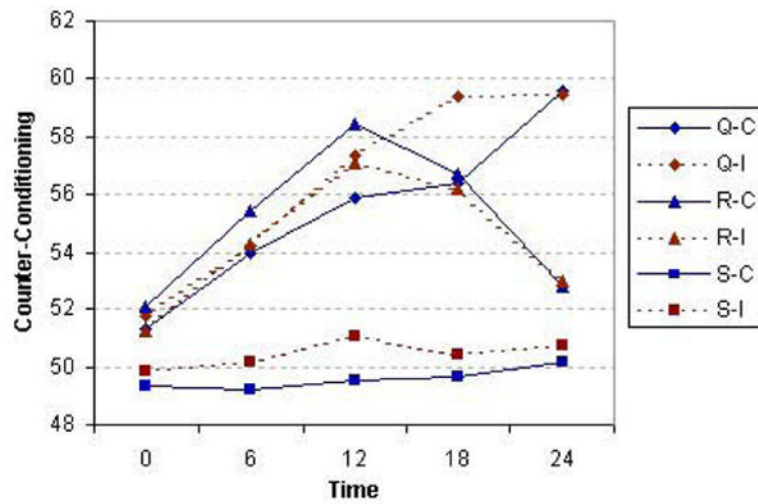
Figure 6.
Patterns of change over 24 mo. for Self-Reevaluation for the Stable Smokers (S), Stable Quitters (Q), and Relapsers(R) in both the intervention and control groups

Figure 7.
Patterns of change over 24 mo. for Environmental Reevaluation for the Stable Smokers (S), Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups
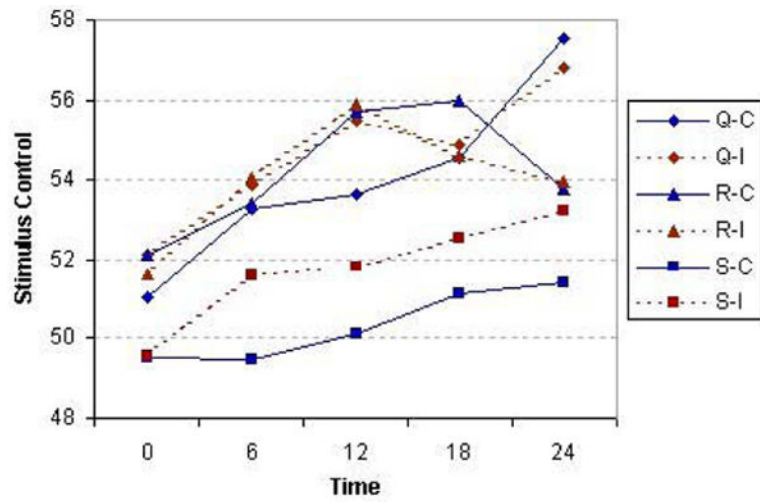
Figure 8.
Patterns of change over 24 mo. for Social Liberation for the Stable Smokers (S), Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups
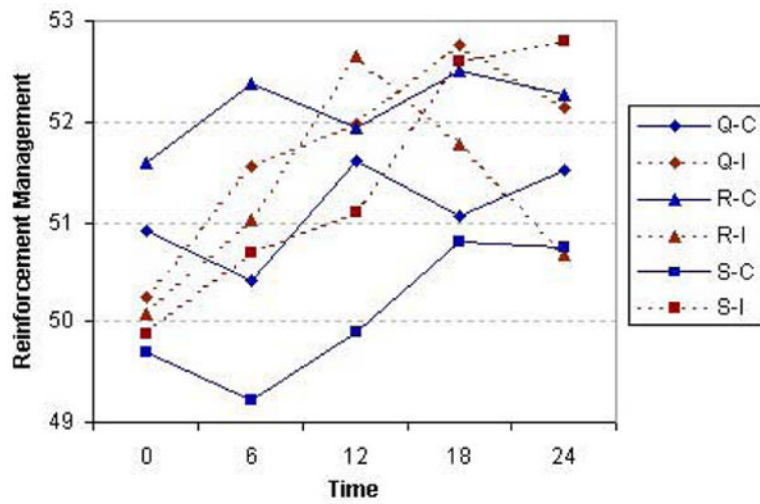
Figure 9.
Patterns of change over 24 mo. for Counter-Conditioning for the Stable Smokers (S), Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups
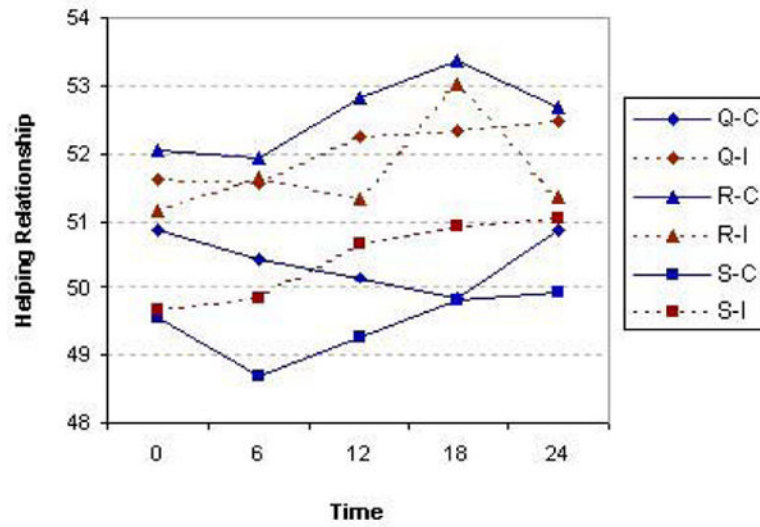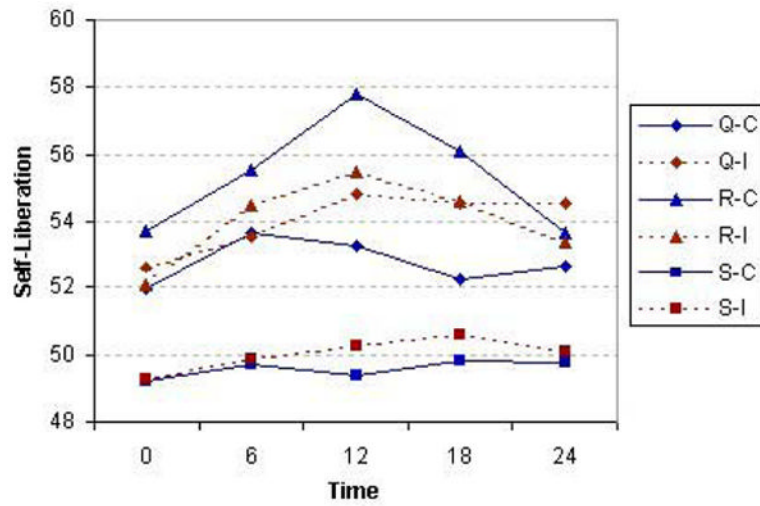
Figure 10.
Patterns of change over 24 mo. for Stimulus Control for the Stable Smokers (S), Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups

Figure 11.
Patterns of change over 24 mo. for Reinforcement Management for the Stable Smokers (S),
Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups

Figure 12.
Patterns of change over 24 mo. for Helping Relationship for the Stable Smokers (S), Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups

Figure 13.
Patterns of change over 24 mo. for Self-Liberation for the Stable Smokers (S), Stable Quitters (Q), and Relapsers (R) in both the intervention and control groups
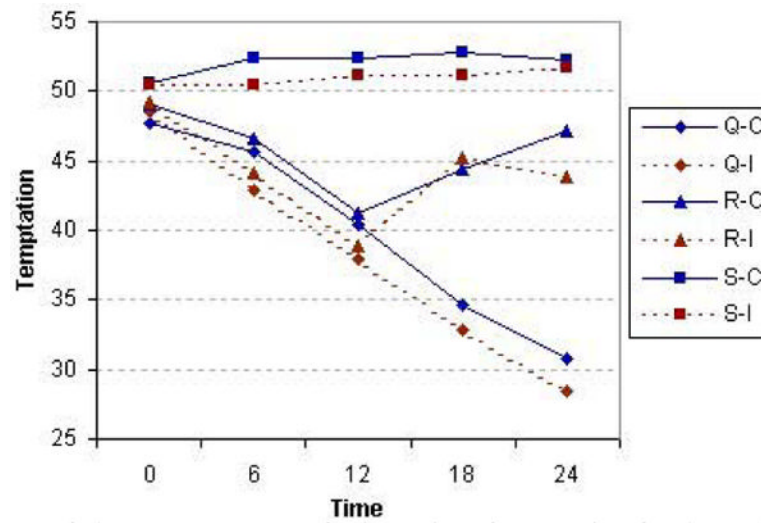
Figure 14.
Patterns of change over 24 mo. for intensity of temptation for the Stable Smokers (S), Stable
Quitters (Q), and Relapsers (R) in both the intervention and control groups

Table 1

Baseline Demographics and Smoking Variables for Stable Quitters, Stable Smokers, and Relapsers

		Stable Smoker (N=3163)	Stable Quitter (N=695)	Relapser & Recycles (N=286)
group	Control %	67.7	64.2	69.6
	Intervention %	32.3	35.8	30.4
Age	Mean	40.4	41.9	39.6
	Std	13.7	14.9	13.7
Education	Mean	12.66	12.94	13.05
	Std	2.24	2.22	2.3
sex	Male %	44.7	41.4	46.5
	Female %	55.3	58.6	53.5
Race	White %	95.4	96.7	96.1
	Black %	2.7	1.9	2.5
	Asian %	0.4	0.4	0.4
	Native American %	1.6	1.0	1.1
Hispanic	No %	97.9	98.1	98.2
	Yes %	2.1	1.9	1.8
Marital	Not Married %	17.5	15.6	15.1
	Living w. Partner %	5.1	4.3	5.3
	Married %	52.5	55.8	58.9
	Widowed %	5.5	6.2	3.5
	Separated %	3.2	4.6	0.7
	Divorced %	15.6	13.1	15.8
	Other %	0.6	0.3	0.7
Cigarettes/day	Mean	22.1[*]	17.6	18.5
	Std	10.9	10.4	10.9
Time to 1st Cigarette	Mean	46.8[*]	78.6	92.4
	Std	88.7	119.2	136.2

[*] Stable Smoker significantly different from other two groups (p < .001)

Table 2

Sample Items and Alpha Coefficients for the Ten Processes of Change

PROCESSES	Sample Item
Experiential	
Consciousness Raising	I look for information related to smoking.
Dramatic Relief	Warnings about health hazards of smoking move me emotionally.
Self-Reevaluation	My depending on cigarettes makes me feel disappointed in myself
Environmental Reevaluation	I stop to think that smoking is polluting the environment.
Social Liberation	I notice that public places have sections set aside for non-smokers.
Behavioral	
Counter-conditioning	I do something else instead of smoking when I need to relax.
Stimulus Control	I remove things from my place of work that remind me of smoking.
Reinforcement Management	I am rewarded by others if I don't smoke.
Helping Relationships.	I have someone who listens when I need to talk about my smoking.
Self-Liberation	I tell myself I am able to quit smoking if I want to.

Table 3

Point Prevalence Quit Rates and Abstinence Rates for Intervention and Control Groups at Each Follow-up.

Quitting Rate			Month			
Group	N	6	12	18	24	
Control	2,786	7.4%	14.5%	16.6%	19.7%	
Intervention	1,358	9.7%	18.0%	21.7%	25.6%	
Relapsing Rate						
Control			32.1%	31.9%	26.6%	
Intervention			26.6%	27.3%	17.3%	