*Behavior Change*

# The Transtheoretical Model of Health Behavior Change

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### Abstract

*The transtheoretical model posits that health behavior change involves progress through six stages of change: precontemplation, contemplation, preparation, action, maintenance, and termination. Ten processes of change have been identified for producing progress along with decisional balance, self-efficacy, and temptations. Basic research has generated a rule of thumb for at-risk populations: 40% in precontemplation, 40% in contemplation, and 20% in preparation. Across 12 health behaviors, consistent patterns have been found between the pros and cons of changing and the stages of change. Applied research has demonstrated dramatic improvements in recruitment, retention, and progress using stage-matched interventions and proactive recruitment procedures. The most promising outcomes to date have been found with computer-based individualized and interactive interventions. The most promising enhancement to the computer-based programs are personalized counselors. One of the most striking results to date for stage-matched programs is the similarity between participants reactively recruited who reached us for help and those proactively recruited who we reached out to help. If results with stage-matched interventions continue to be replicated, health promotion programs will be able to produce unprecedented impacts on entire at-risk populations. (Am J Health Promot 1997;12[1]:38–48.)*

*Key Words:* Transtheoretical Model, Stages of Change, Proactive Recruitment, Computerized Interventions, Decisional Balance, Processes of Change

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The transtheoretical model uses a temporal dimension, the stages of change, to integrate processes and principles of change from different theories of intervention, hence the name transtheoretical. This model emerged from a comparative analysis of leading theories of psychotherapy and behavior change. The goal was a systematic integration of a field that had fragmented into more than 300 theories of psychotherapy.[1] The comparative analysis identified 10 distinct processes of change, such as consciousness raising from the Freudian tradition, contingency management from the Skinnerian tradition, and helping relationships from the Rogerian tradition.

In an empirical analysis of self-changers compared to smokers in professional treatments, we assessed how frequently each group used each of the 10 processes.[2] Our research participants kept saying that they used different processes at different times in their struggles with smoking. These naive subjects were teaching us about a phenomenon that was not included in any of the multitude of therapy theories. They were revealing to us that behavior change unfolds through a series of stages.[3]

From the initial studies of smoking, the stage model rapidly expanded in scope to include investigations and applications with a broad range of health and mental health behaviors. These include alcohol and substance abuse, anxiety and panic disorders, delinquency, eating disorders and obesity, high-fat diets, AIDS prevention, mammography screening, medication compliance, unplanned pregnancy prevention, pregnancy and smoking, radon testing, seden-

tary lifestyles, sun exposure, and physicians practicing preventive medicine. Over time, these studies have applied, expanded, validated, and challenged the core constructs of the transtheoretical model.

## CORE CONSTRUCTS

### Stages of Change

The stage construct is important in part because it represents a temporal dimension. Change implies phenomena occurring over time, but surprisingly, none of the leading theories of therapy contained a core construct representing time. Behavior change was often construed as an event, such as quitting smoking, drinking, or overeating. The transtheoretical model construes change as a process involving progress through a series of six stages.

Precontemplation is the stage in which people are not intending to take action in the foreseeable future, usually measured as the next 6 months. People may be in this stage because they are uninformed or underinformed about the consequences of their behavior. Or they may have tried to change a number of times and become demoralized about their abilities to change. Both groups tend to avoid reading, talking, or thinking about their high risk behaviors. They are often characterized in other theories as resistant or unmotivated clients or as not ready for therapy or health promotion programs. The fact is, traditional health promotion programs were not ready for such individuals and were not motivated to match their needs.

Contemplation is the stage in which people are intending to change in the next 6 months. They are more aware of the pros of changing but are also acutely aware of the cons. This balance between the costs and benefits of changing can produce profound ambivalence that can keep people stuck in this stage for long periods of time. We often characterize this phenomenon as chronic contemplation or behavioral procrastination. These folks are also not ready for traditional action-oriented programs.

Preparation is the stage in which

people are intending to take action in the immediate future, usually measured as the next month. They have typically taken some significant action in the past year. These individuals have a plan of action, such as joining a health education class, consulting a counselor, talking to their physician, buying a self-help book, or relying on a self-change approach. These are the people we should recruit for such action-oriented programs as smoking cessation, weight loss, or exercise.

Action is the stage in which people have made specific overt modifications in their life styles within the past 6 months. Since action is observable, behavior change often has been equated with action. But in the transtheoretical model, action is only one of six stages. Not all modifications of behavior count as action in this model. People must attain a criterion that scientists and professionals agree is sufficient to reduce risks for disease. In smoking, for example, the field used to count reduction in the number of cigarettes as action, or switching to low tar and nicotine cigarettes. Now, the consensus is clear—only total abstinence counts. In the diet area, there is a consensus that less than 30% of calories should be consumed from fat. But there are those who believe that this guideline needs to be lowered to 25% or even 20%.

Maintenance is the stage in which people are working to prevent relapse but they do not apply change processes as frequently as do people in action. They are less tempted to relapse and increasingly more confident that they can continue their changes. Based on temptation and self-efficacy data, we estimated that maintenance lasts from 6 months to about 5 years. While this estimate may seem somewhat pessimistic, longitudinal data in the 1990 Surgeon General's report gave some support to this temporal estimate.[4] After 12 months of continuous abstinence, the percentage of individuals who returned to regular smoking was 43%. It was not until 5 years of continuous abstinence that the risk for relapse dropped to 7%.

In one of our early articles, we gave the misleading impression that

we viewed relapse as a separate stage. Relapse is one form of regression, which is a return to an earlier stage. Relapse is the return from action or maintenance to an earlier stage. The bad news is that relapse tends to be the rule when action is taken for most health behavior problems. The good news is that for smoking and exercise only about 15% of people regress all the way to the precontemplation stage. The vast majority return to contemplating or preparing for another serious attempt at action.

Termination is the stage in which individuals have zero temptation and 100% self-efficacy. No matter whether they are depressed, anxious, bored, lonely, angry, or stressed, they are sure they will not return to their old unhealthy habit as a way of coping. It is as if they never acquired the habit in the first place. In a study of former smokers and alcoholics, we found that less than 20% of each group had reached the criteria of zero temptation and total self-efficacy.[5] The criteria may be too strict, or it may be that this stage is an ideal goal for the majority of people. In other areas, like exercise, consistent condom use, and weight control, the realistic goal may be a lifetime of maintenance. Since termination may not be a practical reality for a majority of people, it has not been given as much emphasis in our research.

### Processes of Change

Processes of change are the covert and overt activities that people use to progress through the stages. Processes of change provide important guides for intervention programs, since the processes are like the independent variables that people need to apply to move from stage to stage. Ten processes have received the most empirical support in our research to date.[6]

*Consciousness Raising* involves increased awareness about the causes, consequences, and cures for a particular problem behavior. Interventions that can increase awareness include feedback, education, confrontation, interpretation, bibliotherapy, and media campaigns.

*Dramatic Relief* initially produces increased emotional experiences fol-

lowed by reduced affect if appropriate action can be taken. Psychodrama, role playing, grieving, personal testimonies, and media campaigns are examples of techniques that can move people emotionally.

*Self-reevaluation* combines both cognitive and affective assessments of one's self-image with and without a particular unhealthy habit, such as one's image as a couch potato and an active person. Value clarification, healthy role models, and imagery are techniques that can move people evaluatively.

*Environmental Reevaluation* combines both affective and cognitive assessments of how the presence or absence of a personal habit affects one's social environment such as the effect of smoking on others. It can also include the awareness that one can serve as a positive or negative role model for others. Empathy training, documentaries, and family interventions can lead to such reassessments.

A brief television spot from California's antitobacco campaign was designed to help smokers in precontemplation to progress. In this spot, a middle-aged man clearly in grief says, "I always worried that my smoking would cause lung cancer. I was always afraid that my smoking would lead to an early death. But I never imagined that it would happen to my wife." Then on the screen is flashed the message, "50,000 deaths per year due to passive smoking"—California Department of Health.

There are no action directives in this intervention but there is: (1) consciousness raising—50,000 deaths per year; (2) dramatic relief—around grief, guilt, and fear that can be reduced if appropriate action is taken; (3) self-reevaluation—how do I think and feel about myself as a smoker; and (4) environmental reevaluation—how do I feel and think about the effects of my smoking on my environment.

*Self-liberation* is both the belief that one can change and the commitment and recommitment to act on that belief. New Year's resolutions, public testimonies, and multiple rather than single choices can enhance self-liberation or what the public calls

willpower. Motivation research indicates that people with two choices have greater commitment than people with one choice; those with three choices have even greater commitment; having four choices does not further enhance willpower.[4] So with smokers, for example, three excellent action choices they can be given are cold turkey, nicotine fading, and nicotine replacement.

*Social Liberation* requires an increase in social opportunities or alternatives especially for people who are relatively deprived or oppressed. Advocacy, empowerment procedures, and appropriate policies can produce increased opportunities for minority health promotion, gay health promotion, and health promotion for impoverished people. These same procedures can also be used to help all people change such as smoke-free zones, salad bars in school lunches, and easy access to condoms and other contraceptives.

*Counterconditioning* requires the learning of healthier behaviors that can substitute for problem behaviors. Relaxation can counter stress; assertion can counter peer pressure; nicotine replacement can substitute for cigarettes; and fat-free foods can be safer substitutes.

*Stimulus Control* removes cues for unhealthy habits and adds prompts for healthier alternatives. Avoidance, environmental reengineering, and self-help groups can provide stimuli that support change and reduce risks for relapse. Planning parking lots with a 2-minute walk to the office and putting art displays in stairwells are examples of reengineering that can encourage more exercise.

*Contingency Management* provides consequences for taking steps in a particular direction. While contingency management can include the use of punishments, we found that self-changers rely on rewards much more than punishments. So reinforcements are emphasized, since a philosophy of the stage model is to work in harmony with how people change naturally. Contingency contracts, overt and covert reinforcements, positive self-statements, and group recognition are procedures for increasing reinforcement and the

probability that healthier responses will be repeated.

*Helping Relationships* combine caring, trust, openness, and acceptance as well as support for the healthy behavior change. Rapport building, a therapeutic alliance, counselor calls, and buddy systems can be sources of social support.

## Decisional Balance

Decisional balance reflects the individual's relative weighing of the pros and cons of changing. Originally, we relied on Janis and Mann's model of decision making that included four categories of pros (instrumental gains for self and others and approval for self and others).[7] The four categories of cons were instrumental costs to self and others and disapproval from self and others. In a long series of studies attempting to produce this structure of eight factors, we always found a much simpler structure—just the pros and cons of changing.[8]

## Self-efficacy

Self-efficacy is the situation-specific confidence people have that they can cope with high risk situations without relapsing to their unhealthy or high risk habit. This construct was integrated from Bandura's self-efficacy theory.[9,10]

## Temptation

Temptation reflects the intensity of urges to engage in a specific habit when in the midst of difficult situations. In our research, we typically find three factors reflecting the most common types of tempting situations: negative affect or emotional distress, positive social situations, and craving.[11]

The transtheoretical model has concentrated on five stages of change, 10 processes of change, the pros and cons of changing, self-efficacy, and temptation. In addition, the model includes a measure of the target behavior. The transtheoretical model is also based on critical assumptions about the nature of behavior change and interventions that can best facilitate such change.

## Critical Assumptions

The following are a set of assumptions that drive transtheoretical theory, research, and practice.

(1) No single theory can account for all of the complexities of behavior change. Therefore, a more comprehensive model will most likely emerge from an integration across major theories.

(2) Behavior change is a process that unfolds over time through a sequence of stages.

(3) Stages are both stable and open to change, just as chronic behavioral risk factors are both stable and open to change.

(4) Without planned interventions, populations will remain stuck in the early stages. There is no inherent motivation to progress through the stages of intentional change as there seems to be in stages of physical and psychological development.

(5) The majority of at-risk populations are not prepared for action and will not be served by traditional action-oriented prevention programs. Health promotion can have much greater impacts if it shifts from an action paradigm to a stage paradigm.

(6) Specific processes and principles of change need to be applied at specific stages if progress through the stages is to occur. In the stage paradigm, intervention programs are matched to each individual's stage of change.

(7) Chronic behavior patterns are usually under some combination of biological, social, and self-control. Stage-matched interventions have been primarily designed to enhance self-controls.

## BASIC RESEARCH SUPPORT

Each of the core constructs has been subjected to a wide variety of studies across a broad range of behaviors and populations. Only a sampling of these studies can be reviewed here.

### Stage Distribution

If we are to match the needs of entire populations, we need to know

## Table 1

### Distribution of Smokers by Stage Across Four Different Samples*

| Sample | Precontemplation | Contemplation | Preparation | Sample Size |
|---|---|---|---|---|
| Random digit dial | 42.1% | 40.3% | 17.6% | 4144 |
| Four U.S. worksites | 41.1% | 38.7% | 20.1% | 4785 |
| California | 37.3% | 46.7% | 16.0% | 9534 |
| RI high schools | 43.8% | 38.0% | 18.3% | 208 |

* These studies assess current smokers; therefore, no respondents are in action or maintenance.

the stage distributions of specific high risk behaviors. Table 1 presents results from a series of studies on smoking that have clearly demonstrated that less than 20% of smokers are in the preparation stage in most populations.[12] Approximately 40% of smokers are in the contemplation stage, and another 40% are in precontemplation. These results show that action-oriented cessation programs will not match the needs of the vast majority of smokers.

With a sample of 20,000 members of an HMO, the stage distribution was assessed for 15 health behaviors.[13] While there are variations in the distributions, for these high risk behaviors, the results support a general rule of thumb: 40% in precontemplation, 40% in contemplation, and 20% in preparation.

Our research has focused on the stage distribution of people currently at risk because these are the groups typically targeted for health promotion programs. There is research in the literature on the percentages of populations who were formerly at risk but not currently at risk. For example, of ever smokers, about 45% are former smokers. The Surgeon General's Report of 1990 reports the percent of ever smokers who quit in the last year (57%), 1 to 5 years (10%), and more than 5 years (30%).[4] While such data have epidemiological significance, they are not nearly as helpful in program planning as is the stage distribution of populations currently at risk.

### Pros and Cons Structure Across 12 Behaviors

As indicated earlier, the pros and cons of decisional balance have a

much simpler structure than Janis and Mann's theory suggests. Across studies of 12 different behaviors (smoking cessation, quitting cocaine, weight control, dietary fat reduction, safer sex, condom use, exercise acquisition, sunscreen use, radon testing, delinquency reduction, mammography screening, and physicians practicing preventive medicine), the two-factor structure was remarkably stable.[14]
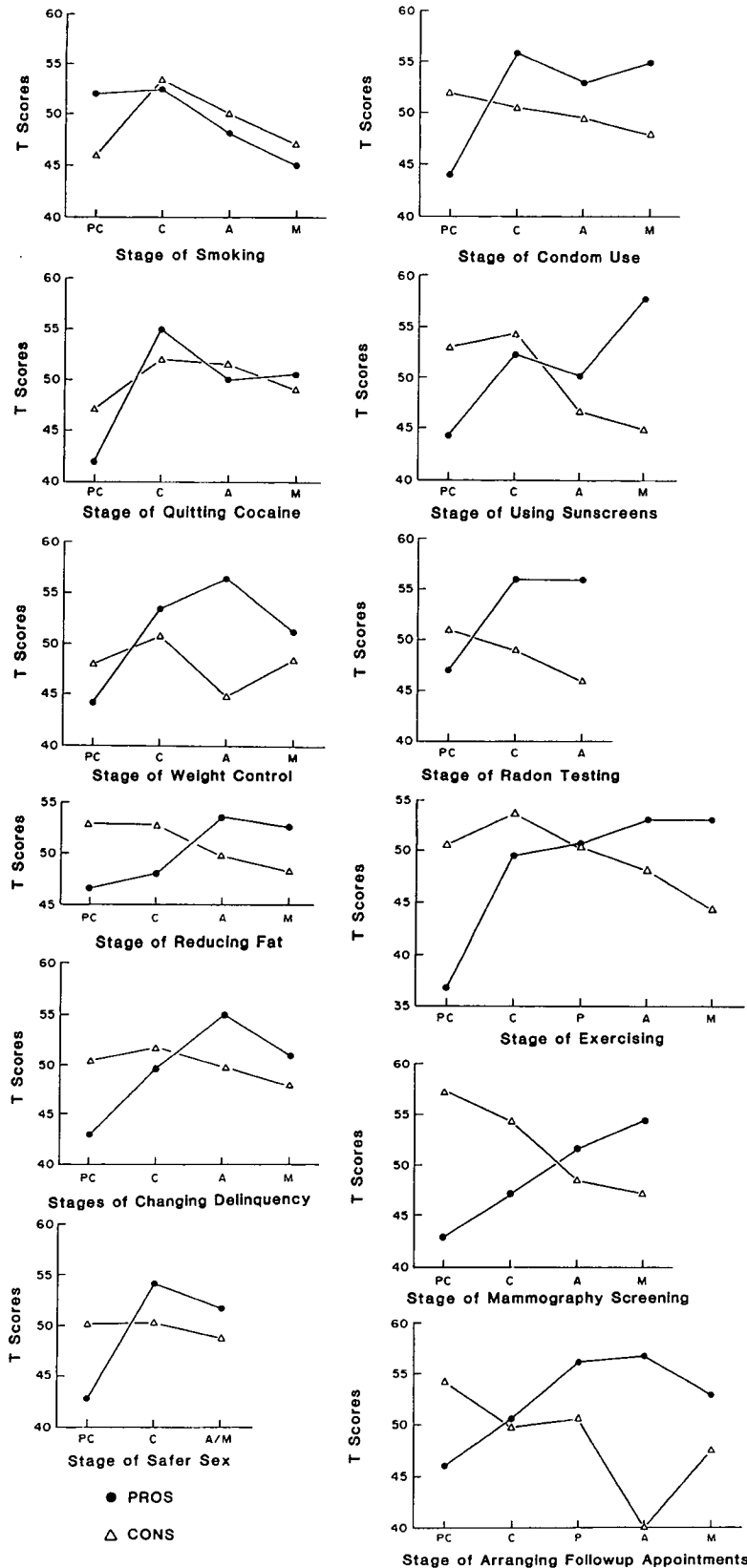
### Integration of Pros and Cons and Stages of Change Across 12 Health Behaviors

Stage is not a theory; it is a variable. A theory requires systematic relationships between a set of variables, ideally culminating in mathematical relationships. Figure 1 shows that in all 12 studies, the pros of changing are higher than the cons for people in precontemplation.[14] In all 12 studies, the pros increase between precontemplation and contemplation. There are no systematic differences on the cons between precontemplation and contemplation. But from contemplation to action for all 12 behaviors, the cons of changing are lower in action than in contemplation. In 11 of the 12 studies, the pros of changing are higher than the cons for people in action.

These basic findings suggest principles for progressing through the stages. To progress from precontemplation to contemplation, the pros of changing must increase. To progress from contemplation to action, the cons of changing must decrease. So with people in precontemplation, we would target the pros for intervention and save the cons for after they

## Figure 1

### The Pros and Cons of Changing Across the Stages of Change for 12 Problem Behaviors



Stage of Smoking

Stage of Condom Use

Stage of Quitting Cocaine

Stage of Using Sunscreens

Stage of Weight Control

Stage of Radon Testing

Stage of Reducing Fat

Stage of Exercising

Stages of Changing Delinquency

Stage of Mammography Screening

Stage of Safer Sex

Stage of Arranging Followup Appointments

● PROS
△ CONS

progress to contemplation. Before progressing to action, we would want to see the pros and cons crossing over, with the pros higher than the cons as a sign of being well prepared for action.

### Strong and Weak Principles of Progress

Across these same 12 studies, mathematical relationships were found between the pros and cons of changing and progress across the stages.[15]

The Strong Principle is:
$$PC \to A \cong 1 \text{ SD} \uparrow PROS$$

Progress from precontemplation to action involves approximately one standard deviation (SD) increase in the pros of changing. On intelligence tests, a one-SD increase would be 15 points, which is a substantial increase.

The Weak Principle is:
$$PC \to A \cong .5 \text{ SD} \downarrow CONS$$

Progress from precontemplation to action involves approximately a .5-SD decrease in the cons of changing. Because the first principle involves twice as great a change as the second, we titled the first strong and the second weak.

Practical implications of these principles are that the pros of changing must increase twice as much as the cons decrease. Perhaps twice as much emphasis should be placed on raising the benefits as on reducing the costs or barriers. For example, if couch potatoes in precontemplation can list only five pros of exercise, then being too busy will be a big barrier to change. But if program participants come to appreciate that there can be more than 50 benefits for 60 minutes of exercise a week, being too busy becomes a relatively smaller barrier.

### Processes of Change Across Behaviors

One of the assumptions of the transtheoretical model is that there is a common set of change processes people can apply across a broad range of behaviors. While we have focused most on 10 separate processes,

we have also examined how these 10 factor together. This is called the higher order structure of the processes. With the higher order, we consistently find two factors: (1) *experiential processes* that include more internal experiences like consciousness raising, dramatic relief, and self-reevaluation; and (2) *behavioral processes* that include more overt activities like helping relationships, contingency management, and stimulus control. The experiential and behavioral processes have replicated across problem behaviors better than have the 10 specific processes.[16]

Typically, we have found support for our standard set of 10 processes across such behaviors as smoking, diet, cocaine use, exercise, condom use, and sun exposure. But the structure of the processes across studies has not been as consistent as the structure of the stages and the pros and cons of changing. In some studies, we find fewer processes and occasionally, we find evidence for one or two more. It is also very possible that with some behaviors fewer change processes may be used. With an infrequent behavior like yearly mammograms, for example, fewer processes may be required to progress to long-term maintenance.[17]

## Integration of Relationships Between Stages and Processes of Change

One of our earliest empirical integrations was the discovery of systematic relationships between the stage people were in and the processes they were applying. This discovery allowed us to integrate processes from theories that were typically seen as incompatible and in conflict. For example, Freudian theory that relied almost entirely on consciousness raising for producing change was viewed as incompatible with Skinnerian theory that relied entirely on contingency management for modifying behavior. But self-changers did not know that these processes were theoretically incompatible, and they taught us that processes from very different theories needed to be emphasized at different stages of change. Table 2 presents our current empirical integration.[18] This integration suggests that in early stages, people apply cog-

#### Table 2

#### Stages of Change in Which Change Processes Are Most Emphasized

| | Stages of Change | | | | |
| --- | --- | --- | --- | --- | --- |
| | Precontemplation | Contemplation | Preparation | Action | Maintenance |
| Processes | Consciousness raising<br>Dramatic relief<br>Environmental reevaluation<br>Self-reevaluation | | Self-liberation | Contingency management<br>Helping relationship<br>Counterconditioning<br>Stimulus control | |

nitive, affective, and evaluative processes to progress through the stages. In later stages, people rely more on commitments, conditioning, contingencies, environmental controls, and social support for progressing toward termination.

Table 2 has important practical implications. To help people progress from precontemplation to contemplation, we need to apply such processes as consciousness raising and dramatic relief. Applying processes like contingency management, counterconditioning, and stimulus control to people in precontemplation would represent a theoretical, empirical, and practical mistake. But for people in action, such strategies would represent an optimal matching.

As with the structure of the processes, the integration of the processes and stages has not been as consistent as the integration of the stages and pros and cons of changing. While part of the problem may be due to the greater complexity of integrating 10 processes across five stages, the processes of change need more basic research.

## APPLICATIONS OF THE TRANSTHEORETICAL MODEL: SMOKING CESSATION INTERVENTIONS AS PROTOTYPES FOR STAGE-MATCHED PROGRAMS

Smoking is costly to individual smokers and to society. In the United States, approximately 47 million

Americans continue to smoke. Over 400,000 preventable deaths per year are attributable to smoking.[4] Globally, the problem promises to be catastrophic. Of the people alive in the world today, 500 million are expected to die from this single behavior, losing approximately 5 billion years of life to tobacco use.[19] If we could make even modest gains in our science and practice of smoking cessation, we could prevent millions of premature deaths and help preserve billions of years of life.

Currently, smoking cessation clinics have little impact. When offered for free by HMOs in the United States, such clinics recruit only 1% of subscribers who smoke. Such behavior health services simply cannot make much difference if they treat such a small percentage of the problem.[20]

Startled by such statistics, behavioral scientists took health promotion programs into communities. The results are now being reported, and in the largest trials ever attempted, the outcomes are discouraging. In the Minnesota Heart Health Program, for example, $40 million was spent with 5 years of intervention in four communities totalling 400,000 people. There were no significant differences between treatment and control communities on smoking, diet, cholesterol, weight, blood pressure, and overall risks for cardiovascular disease.[21]

What went wrong? The investigators speculate that maybe they dilut-

ed their programs by targeting multiple behaviors. But the COMMIT trial had no effects with its primary target of heavy smokers and only a small effect with light smokers.[22]

A closer look at participation rates may explain some of the disappointing results. In the Minnesota study, nearly 90% of smokers in both the treatment and control communities had processed media information about smoking in the past year. But only about 10% had been advised to quit by their physicians.[23] And only about 3% had participated in the most powerful behavioral programs, such as individualized and interactive clinics, classes, and contests. In one of the Minnesota Heart Health studies, smokers were randomly assigned to one of three recruitment methods for home-based cessation programs.[24] These announcements generated 1 to 5% participation rates, with a personalized letter doing the best. We cannot have much impact on the health of our communities if we only interact with a small percentage of populations at high risk for disease and early death.

One alternative is to shift from an action paradigm to a stage paradigm, in order to increase our reach and interact with a much higher percentage of populations at risk. Let us examine how the stage paradigm has been applied to five of the most important phases of health promotion programs.

### Recruitment

Recall that action-oriented cessation programs falter in this first phase of intervention and produce low participation rates. Table 1 reported results that can help explain such low rates. Across four different samples, 20% or less of smokers were in the preparation stage.[12] When we advertise or announce action-oriented programs, we are explicitly or implicitly targeting less than 20% of a population. The other 80% plus are left on their own.

In two home-based recruitments with approximately 5000 and 4600 smokers in each study, we reached out either by telephone alone or by personal letters followed by telephone calls, if needed, and recruited

smokers to stage-matched interventions. For each of five stages, these interventions included self-help manuals; individualized computer feedback reports based on assessments of the pros and cons, processes, self-efficacy, and temptations; and, for some participants, counselor protocols based on the computer reports. Using these proactive recruitment methods and stage-matched interventions, we were able to generate participation rates of 82 to 85%, respectively (Prochaska, et al., unpublished manuscript; Velicer, et al., unpublished manuscript). Such quantum increases in participation rates provide the potential to generate unprecedented impacts with entire populations of smokers.

Population impact equals participation rate times the rate of efficacy or action.[25] If a program produced 30% efficacy (such as long-term abstinence), historically it was judged to be better than a program that produced 25% abstinence. But a program that generates 30% efficacy but only 5% participation has an impact of only 1.5% (30% × 5%). A program that produces only 25% efficacy but 60% participation has an impact of 15%. With health promotion programs, this would be 1000% greater impact on a high risk population.

The stage paradigm would shift our outcomes from efficacy alone to impact. To achieve such high impact, we need to shift from reactive recruitment, where we advertise or announce our programs and react when people reach us, to proactive recruitments, where we reach out to interact with all potential participants.

But proactive recruitment alone won't work. In the most intensive recruitment protocol to date, Lichtenstein and Hollis had physicians spend time with each smoker just to get them to sign up for an action-oriented cessation clinic.[26] If that didn't work, a nurse spent 10 minutes persuading each smoker to sign up, followed by 12 minutes with a videotape and health educator and even a proactive counselor call if necessary. The base rate was 1% participation. This proactive protocol resulted in

### Figure 2

**Pre-therapy Stage Profiles for Premature Terminators, Appropriate Terminators, and Continuers**
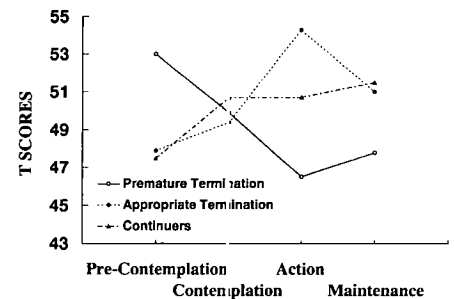


35% of smokers in precontemplation signing up. But only 3% showed up and 2% finished. With a combination of smokers in contemplation and preparation, 65% signed up, 15% showed up, and 11% finished.

To optimize our impacts, we need to use proactive protocols to recruit participants to programs that match the stage they are in. Once we generate high recruitment rates, we then have to be concerned about high retention rates, lest we lose many of the initial participants in our health promotion programs.

### Retention

One of the skeletons in the closet of psychotherapy and behavior change interventions is their relatively poor retention rates. Across 125 studies, the average retention rate was only about 50%.[27] Furthermore, this meta-analysis found few consistent predictors of which participants would drop out prematurely and which would continue in therapy. In studies on smoking, weight control, substance abuse, and a mixture of Diagnostic and Statistical Manual IV (DSM-IV) disorders, stage-of-change measures proved to be the best predictors of premature termination. Figure 2 presents the stage profile of three groups of therapy participants in treatment for a variety of mental health problems: the pretreatment stage profile of the entire 40% who dropped out prematurely as judged by their therapist was that of patients in precontemplation. The 20%

who terminated quickly but appropriately had a profile of patients in action. Using pretreatment stage-related measures, we were able to correctly predict retention status for 93% of the three groups (Medeiros, et al., unpublished manuscript).

We simply cannot treat people with a precontemplation profile as if they were ready for action interventions and expect them to stay in treatment. Relapse prevention strategies would be indicated with smokers who are taking action. But those in precontemplation are more likely to need dropout prevention strategies.

The best strategy we have found to promote retention is matching our interventions to stage of change. In four smoking cessation studies using such matching strategies, we found we were able to retain smokers in the precontemplation stage at the same high levels as those who started in the preparation stage (Prochaska, et al., unpublished manuscript; Velicer, et al., unpublished manuscript).
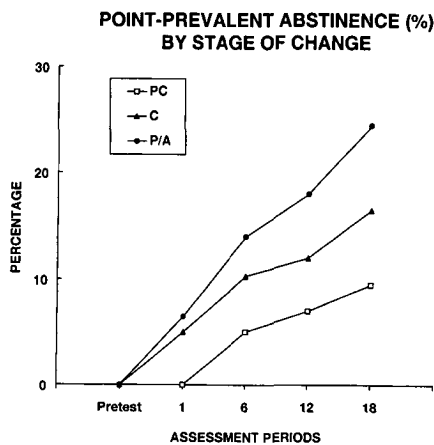
### Progress

The amount of progress participants make following health promotion programs is directly related to the stage they were in at the start of the interventions. This *stage effect* is illustrated in Figure 3, where smokers initially in precontemplation show the smallest amount of abstinence over 18 months and those in preparation progress the most.[28] Across 66 different predictions of progress, we found that smokers starting in contemplation were about two-thirds more successful than those in precontemplation at 6-, 12-, and 18-month follow-ups. Similarly, those in preparation were about two-thirds more successful than those in contemplation at the same follow-ups.[29]

These results can be used clinically. A reasonable goal for each therapeutic intervention with smokers is to help them progress one stage. If over the course of brief therapy they progress two stages, they will be about two-and-two-thirds times more successful at longer term follow-ups.[29]

This strategy has been taught to more than 4000 primary care physicians, nurses, health educators, and physicians' assistants in Britain's Na-

### Figure 3

**Percentage Abstinent over 18 Months for Smokers in Precontemplation (PC), Contemplation (C), and Preparation (C/A) Stages Before Treatment (n = 570)**



tional Health System. With stage-matched counseling, the strategic goal is to help each patient progress one stage following one brief intervention. One of the first reports is a marked improvement in the morale of such health promoters intervening with all patients who smoke, abuse substances, and have unhealthy diets (P. Mason, unpublished data, 1996). These professionals now have strategies that match the needs of all of their patients, not just the minority prepared to take action. Furthermore, these professionals can assess progress across stages in the majority of their patients, where previously they experienced mostly failure when taking action was their only measure of movement.

### Process

To help populations progress through the stages, we need to understand the processes and principles of change. One of the fundamental principles for progress is that different processes of change need to be applied at different stages of change. Traditional conditioning processes like counterconditioning, stimulus control, and contingency control can be highly successful for participants taking action but can produce resis-

tance with individuals in precontemplation. With these individuals, more experiential processes like consciousness raising and dramatic relief can move people cognitively and affectively, and help them shift to contemplation.[31]

After 15 years of research, we have identified 14 variables on which to intervene in order to accelerate progress across the first five stages of change.[30] At any particular stage, we only need to intervene with a maximum of six variables. To help guide individuals at each stage of change, we have developed computer-based expert systems that can deliver individualized and interactive interventions to entire populations.[31] These computer programs can be used alone or in conjunction with counselors.

### Outcomes

In our first large-scale clinical trial, we compared four treatments: (1) one of the best home-based action-oriented cessation programs (standardized); (2) stage-matched manuals (individualized); (3) expert system computer reports plus manuals (interactive); and (4) counselors plus computers and manuals (personalized). We randomly assigned by stage 739 smokers to one of the four treatments.[28]

In the computer condition, participants completed by mail or telephone 40 questions that were entered in our central computers and generated feedback reports. The reports informed participants about their stage of change, their pros and cons of changing, and their use of change processes appropriate to their stages. At baseline, participants were given positive feedback on what they were doing correctly and guidance on which principles and processes they needed to apply more in order to progress. In two progress reports delivered over the following 6 months, participants also received positive feedback on any improvement they made on any of the variables relevant to progressing. So, demoralized and defensive smokers could begin progressing without having to quit and without having to work too hard. Smokers in the con-

**Figure 4**

**Point Prevalence Abstinence (%) for Four Treatment Groups at Pretest and at 6, 12, and 18 Months**
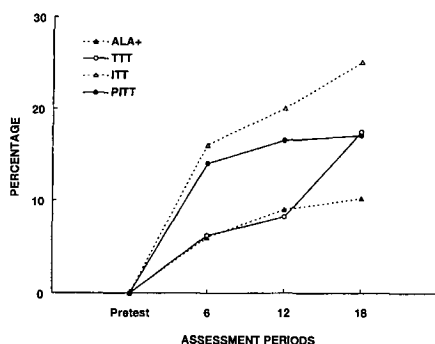


templation stage could begin taking small steps, like delaying their first cigarette in the morning for an extra 30 minutes. They could choose small steps that would increase their self-efficacy and help them become better prepared for quitting.

In the personalized condition, smokers received four proactive counselor calls over the 6-month intervention period. Three of the calls were based on the computer reports. On the other call, counselors reported much more difficulty in interacting with participants without any progress data. Without scientific assessments, it was much harder for both clients and counselors to tell whether any significant progress had occurred since their last interaction.

Figure 4 presents point prevalence abstinence rates for each of the four treatment groups over 18 months with treatment ending at 6 months.[28] The two self-help manual conditions paralleled each other for 12 months. At 18 months, the stage-matched manuals moved ahead. This is an example of a *delayed action effect,* which we often observe with stage-matched programs. It takes time for participants in early stages to progress all the way to action. Therefore, some treatment effects as measured by action will be observed only after considerable delay. But it is encouraging to find treatments producing therapeutic effects months and even years after treatment ended.

The computer alone and comput-

er plus counselor conditions paralleled each other for 12 months. Then, the effects of the counselor condition flattened out while the computer condition effects continued to increase. We can only speculate as to the delayed differences between these two conditions. Participants in the personalized condition may have become somewhat dependent on the social support and social control of the counselor calling. The last call was after the 6-month assessment, and benefits were observed at 12 months. Termination of the counselors could result in no further progress because of the loss of social support and control. The classic pattern in smoking cessation clinics is rapid relapse beginning as soon as the treatment is terminated. Some of this rapid relapse could well be due to the sudden loss of social support or social control provided by the counselors and other participants in the clinic.

The next test was to demonstrate the efficacy of the expert system when applied to an entire population recruited proactively. With over 80% of 5170 smokers participating and fewer than 20% in the preparation stage, we demonstrated significant benefits of the expert system at each 6-month follow-up (Prochaska, et al., unpublished manuscript). Furthermore, the advantages over proactive assessment alone increased at each followup for the full 2 years assessed. The point prevalence abstinence rates for the expert system at 6, 12, 18, and 24 months were 9.78, 18.0, 21.7, and 25.6%, respectively, compared to 7.4, 14.5, 16.6, and 19.7% for the assessment alone. The implications here are that expert system interventions in a population can continue to demonstrate benefits long after the intervention has ended.

We then showed excellent replication of the expert system's efficacy in an HMO population of 4653 smokers with 85% recruited (Prochaska, et al., unpublished manuscript; Velicer, et al., unpublished manuscript). At 18-month follow-up in the first study, the abstinence rate for the expert system was 21.7% vs. 16.6% for assessment alone. In the HMO study, the

abstinence rate for the expert system was 23.2% vs. 17.5% for assessment alone. The difference between the expert system and assessment alone for the two studies was 5.9 and 5.7 percentage points, respectively. These replicated differences were highly significant as well. While working on a population basis, we were able to produce the level of success normally found only in intense clinic-based programs with low participation rates of much more selected samples of smokers. The implication is that once expert systems are developed and show effectiveness with one population, they can be transferred at much lower cost and produce replicable changes in new populations.

**Enhancing Interactive Interventions**

In recent benchmarking research, we have been trying to create enhancements to our expert system to produce even greater outcomes. In the first enhancement in our HMO population, we added a personal hand-held computer designed to bring the behavior under stimulus control (Prochaska, et al., unpublished manuscript). This commercially successful innovation was an action-oriented intervention that did not enhance our expert system program on a population basis. In fact, our expert system alone was twice as effective as the system plus the enhancement. There are two major implications here: (1) more is not necessarily better, and (2) providing interventions that are mismatched to stage can make outcomes markedly worse.

**Counselor Enhancements**

In our HMO population, counselors plus expert system computers were outperforming expert systems alone at 12 months (Prochaska, et al., unpublished manuscript). But at 18 months, the counselor enhancement had declined while the computers alone had increased. Both interventions were producing identical outcomes of 23.2% abstinence, which are excellent for an entire population. Why did the effect of the counselor condition drop after the intervention? Our leading hypothesis is that people can become dependent

on counselors for the social support and social monitoring that they provide. Once these social influences are withdrawn, people may do worse. The expert system computers, by contrast, may maximize self-reliance. In a current clinical trial, we are fading out counselors over time as a method for dealing with dependency on the counselor. If fading is effective, it will have implications for how counseling should be terminated: gradually over time rather than suddenly.

We believe that the most powerful change programs will combine the personalized benefits of counselors and consultants with the individualized, interactive, and data-based benefits of expert system computers. But to date we have not been able to demonstrate that more costly counselors, who had been our most powerful change agents, can actually add value over computers alone. These findings have clear implications for cost-effectiveness of expert systems for entire populations needing health promotion programs.

## Interactive vs. Noninteractive Interventions

Another important aim of the HMO project was to assess whether interactive interventions (computer-generated expert systems) are more effective than noninteractive communications (self-help manuals) when controlling for number of intervention contacts (Velicer, et al., unpublished manuscript). At 6, 12, and 18 months for groups of smokers receiving a series of one, two, three, or six interactive vs. noninteractive contacts, the interactive interventions (expert system) outperformed the noninteractive manuals in all four comparisons. In three of the comparisons (1, 2, and 3), the difference at 18 months was at least five percentage points, a difference between treatment conditions assumed to be clinically significant. These results clearly support the hypothesis that interactive interventions will outperform the same number of noninteractive interventions.

These results support our hypothesis that the most powerful health promotion programs for entire popu-

lations will be interactive. In the reactive clinical literature, it is clear that interactive interventions such as behavioral counseling produce greater long-term abstinence rates (20 to 30%) than do noninteractive interventions such as self-help manuals (10 to 20).[32-34] It should be kept in mind that these traditional action-oriented programs were implicitly or explicitly recruiting for populations in the preparation stage. Our results indicate that even with proactively recruited smokers with less than 20% in the preparation stage, the long-term abstinence rates are in the 20 to 30% range for the interactive interventions and in the 10 to 20% range for the noninteractive interventions. The implications are clear. Providing interactive interventions via computers are likely to produce greater outcomes than relying on noninteractive communications, such as newsletters, media, or self-help manuals.

## Proactive vs. Reactive Results

We believe that the future of health promotion programs lies with stage-matched, proactive, and interactive interventions. Much greater impacts can be generated by proactive programs because of much higher participation rates, even if efficacy rates are lower. But we also believe that proactive programs can produce comparable outcomes to traditional reactive programs. It is counterintuitive to believe that comparable outcomes can be produced with people who we reach out to help as with people who call us for help. But that is what informal comparisons strongly suggest. We compared 18-month follow-ups for all subjects who received our three expert system reports in our previous reactive study[28] and in our first proactive study (Prochaska, et al., unpublished manuscript). The abstinence curves are remarkably similar.

The results with our counseling plus computer conditions were even more impressive. Proactively recruited smokers working with counselors and computers had higher abstinence rates at each follow-up than did the smokers who had called for help. One of the differences is that

our proactive counseling protocol had been revised and hopefully improved based on previous data and experience. But, the point is, if we reach out and offer people improved health behavior programs that are appropriate for their stage, we probably can produce efficacy or abstinence rates at least equal to those we produce with people who reach out to us for help. Unfortunately, there is no experimental design that could permit us to randomly assign people to proactive vs. reactive recruitment programs. We are left with informal but provocative comparisons.

If these results continue to be replicated, health promotion programs will be able to produce unprecedented impacts on entire populations. We believe that such unprecedented impacts require scientific and professional shifts:

(1) from an action paradigm to a stage paradigm;
(2) from reactive to proactive recruitment;
(3) from expecting participants to match the needs of our programs to having our programs match their needs; and
(4) from clinic-based to population-based behavioral health programs that still apply the field's most powerful individualized and interactive intervention strategies.

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