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Promoting the Maintenance of Health Behavior Change: Recommendations for the Next Generation of Research and Practice

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This article highlights several broad themes that emerged from the series of papers presented at the National Heart, Lung, and Blood Institute conference, "Maintenance of Behavior Change in Cardiorespiratory Risk Reduction," with a view to generating recommendations for the next generation of research and practice. Major recommendations center around the need for (a) new models of population health behavior change and maintenance that integrate individual-level with broader environmental and macro-level policy influences; (b) a fuller model of the maintenance process, which views maintenance more as a journey than as a destination; and (c) more theory-based and interdisciplinary research on the maintenance process and on strategies for assisting special populations and addressing more than one behavioral risk at a time.

Key words: maintenance, health behavior change

Several factors make this a critical time to take stock of progress and problems in health behavior change maintenance for cardiorespiratory health. First, the challenge is pressing. As we head into the 21st century, most trends for obesity and weight management, tobacco use, physical activity, and diet are going in the wrong direction. Jeffery and colleagues (2000) report that the prevalence of obesity in the United States has risen from 25% in the 1960s to about 33% of the population today. Ockene and colleagues (2000) point out that, after decades of decline, adult smoking rates in the population stabilized in 1990 and now hover around an unacceptably high 25% (for both men and women) and have increased to the same level for high school seniors. Marcus et al. (2000) show that the nation's "exercise revolution" has peaked—resulting in recent decreases in population levels of physical activity. Declines in physical activity levels begin at age 6 and continue over the life cycle: About 70% of adults over age 45 get no regular exercise. Kumanyika et al. (2000) report mixed results for diet and nutrition: Although the percentage of calories from fat is on the decline, only 25% of adult Americans meet the goal of 30% or less of calories from fat, sodium intake is increasing, and a minority of Americans consume the recommended daily minimum of fiber, fruit, and vegetables. As the U.S. population ages, the potential impact of these trends on the future burden of cardiorespiratory disease is greater than ever before in our history.

On the other hand, present-day opportunities for intervening to improve population health behavior also are greater than ever. During the past 20 years, there have been impressive gains in the science and practice of health behavior change at the individual and population levels. Through behavioral intervention research based principally on Bandura's social learning theory (Bandura, 1986) and the health belief model (e.g., Janz & Becker, 1984), much more is known today than 20 years ago about the requirements of effective *individual* health behavior change. Prochaska and DiClemente's stages of change model (Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992; Velicer, Prochaska, Fava, LaForge, & Rossi, 1999) has had a profound impact on the design and delivery of health behavior change for populations. This model has helped to propel a shift away from strictly clinical treatment models toward broader public health models by applying principles of health behavior change to entire populations, not just the small percentage of motivated treatment volunteers ready for action, but also the skeptical contemplators and resistant precontemplators (Lichtenstein & Glasgow, 1992; Marcus et al., 2000; Miller & Rollnick, 1991). Newer social ecological models of health behavior change have been advanced to integrate individual-level and broader environmental and policy determinants of health behavior change and maintenance (e.g., McKinlay, 1995; Stokols, 1996).

During the same period, major advances in biopsychosocial research have clarified the basic mechanisms linking behavior and health, and pointed to promising new biobehavioral intervention strategies. For instance, advances in understanding the neurochemistry of nicotine and tobacco dependence led to the development of new pharmacotherapies that have significantly boosted behavioral treatment outcomes (Agency for Health Care Policy and Research, 1996). Similarly, research into the psychobiology of fat appetite and the role of metabolic factors as promoters of fat

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and protein intake, along with the recent discovery of the "obese" (or "ob") gene, has stimulated work to develop new models of food intake and new classes of drugs to regulate appetite and energy expenditure—drugs with the potential to significantly enhance existing behavioral weight loss and lipid-lowering treatments (Glanz, 1998).

As a result of these advances, there now exist individual-level interventions that work reasonably well to produce short-term change in most of the health-damaging behaviors addressed in this series of articles, along with a growing awareness of the critical environmental and policy supports needed to motivate and assist individual behavior change. Effective treatments are chiefly cognitive–behavioral, supplemented with pharmacological agents for addictive and appetitive behaviors, and implementation of such treatments over the past two decades has resulted in improved end-of treatment and short-term (6- to 24-month) success (Orleans, Gruman, Ulmer, Emont, & Hollendonner, 1999). These rates compare favorably with those for the medical treatment of common illnesses such as adult onset diabetes, hypertension, and asthma (McClellan, O'Brien, Hoffman, & Kleber, 1998). Moreover, one can point to growing success in packaging and applying these treatments, especially minimal-contact and self-help treatments, for broad dissemination (e.g., Curry, 1993). The shift from fee-for-service medicine to managed health care systems provides new incentives and opportunities to disseminate effective and efficiently packaged interventions and to reach historically underserved low-income populations (Orleans, in press). And, finally, advances in information and communication technologies provide new vehicles for targeting and individualizing health behavior change and maintenance interventions (Skinner, Campbell, Rimer, Curry, & Prochaska, in press).

However, as this conference has highlighted, there has been much less progress in promoting behavior change maintenance following initial short-term health behavior change. Although there are intriguing differences in the time course and determinants of relapse across the different risk factors (e.g., most weight loss relapse begins 6 months *after* treatment [Jeffery et al., 2000] and most smoking relapse takes place *before* the 6-month posttreatment follow-up [Ockene et al., 2000]), relapse remains the norm, regardless of the behavior in question. This section highlights a few of the "big picture" themes that emerged from the data presented with a view toward defining promising directions for the next generation of research and practice to improve behavior change maintenance.

Need for New Models for Population Health Behavior Change and Maintenance

The explicit charge to conference presenters was to describe progress and problems in achieving health behavior change maintenance at the *individual level.* However, given the continued high population prevalence of obesity, tobacco use, sedentary lifestyle and unhealthy diet, the emphasis in each of the articles in this issue has been on challenges in promoting the maintenance of health behavior change within the general healthy population (Jeffery et al., 2000; Kumanyika et al., 2000; Marcus et al., 2000; Ockene et al., 2000). This dual concern for individual-level and population-based health behavior change recalls an anecdote that John McKinlay shared more than 20 years ago, at the first national American Heart Association Conference on behavioral approaches to cardiovascular risk reduction, in arguing for population models of health behavior change. This anecdote applies directly to the maintenance process and helps to shift the focus to the forest from the trees.

In this anecdote, McKinlay (1975) recounted the tale of a physician who lamented,

> "You know," he said, "Sometimes it feels like this. There I am standing by the shore of a swiftly flowing river, and I hear the cry of a drowning man. So I jump into the river, put my arms around him, pull him to shore, and apply artificial respiration. Just as he begins to breathe, someone else cries out for help. So I jump into the river again, reach him, pull him to shore, apply artificial respiration, and then, as he begins to breathe, there's another cry for help. So back into the river again, reaching, pulling, applying breathing, and then another yell. I'm so busy jumping in and pulling them to shore, that I have no time to see who the [heck] . . . upstream is pushing them in." (p. 7)

McKinlay went on to point out that efforts to apply behavioral science to cardiovascular risk historically have focused on "downstream," individual-level behavior change interventions at the expense of devoting sufficient attention or resources to potentially more powerful "upstream" interventions—ranging from population-oriented primary care, worksite, school and community strategies, to macro-level initiatives and public policy interventions. He has since advanced the comprehensive population-model for health behavior change outlined in Table 1 (McKinlay, 1995).

McKinlay's model starts with downstream, individual-level interventions aimed at persons who possess the risk factor (e.g., tobacco use, improper diet, insufficient exercise). However, it goes on to include "midstream" interventions aimed at defined populations and involving mediation through important organizational channels or natural environments, such as schools, worksites, clinics or health plans, communities and states, as well as and "upstream" public policy and environmental interventions designed to subvert or redirect strong societal and industry counterforces at the broadest population levels (McKinlay, 1993, 1995; McKinlay & Marceau, 1999). As Jeffery (1989) described, key upstream strategies include (a) economic incentives (e.g., excise taxes on high-fat or tobacco products, reimbursement for prevention treatments); (b) protection from environmental hazards (e.g., reduced access to dangerous products, product redesign); and (c) reduced exposure to advertising or promotion of unhealthy behaviors (e.g., national public education campaigns, food labeling, counter-advertising). McKinlay argued that effective population-level prevention requires applications across the full spectrum—from individual–clinical models, to interventions aimed at primary care providers, health plans, schools, worksites and communities, to public policy and environmental interventions powerful enough to subvert or redirect the strong societal and industry counterforces (McKinlay, 1995; McKinlay & Marceau, 1999).

Table 1
Overview of McKinlay's (1995) Population-Based Health Promotion Model

Type of intervention	Description	Specific activities
Downstream	Individual-level interventions for those who possess the risk factor (e.g., tobacco use, improper diet, sedentary lifestyle) or suffer from risk-related diseases or conditions (e.g., obesity, diabetes), with an emphasis on changing, rather than preventing, health-damaging behaviors	Group and individual counseling Patient health education and cognitive behavioral interventions Self-help programs and tailored health communications Pharmacologic treatments
Midstream	Population-level interventions that target defined populations for the purpose of changing or preventing health-damaging behaviors, and involve mediation through important organizational channels or natural environments	Worksite and community-based health promotion and disease prevention programs Primary care screening and intervention programs that reach entire populations School-based youth prevention programs and policies Community-based interventions focused on defined at-risk populations (e.g., physical activity programs for older adults)
Upstream	Macro-level state and national public policy and environmental interventions to strengthen social norms and supports for healthy behaviors and to redirect unhealthy societal and industry counterforces	Nationwide public education and media campaigns (e.g., food labeling, tobacco counter-advertising) Economic incentives (e.g., excise taxes on high-fat food and tobacco products, reimbursement for health behavior change treatments) Policies reducing access to unhealthy products (e.g., pricing, access, product design) Policies reducing the advertising and promotion of unhealthy products and behaviors (e.g., proposed Food & Drug Administration tobacco regulations)

In effect, what McKinlay argued is that success in achieving short-term behavior change and maintaining it long-term requires broad-spectrum approaches—a "full court press" combining effective downstream (individually oriented) with midstream (organizational, worksite, community) interventions and promising upstream public policies. Figure 1 applies this model to strategies for increasing physical activity among older adults. The interventions proposed range from individually oriented patient education and exercise interventions, to expanded insurance coverage for effective individual-level treatments, and macro-level environmental changes that facilitate physical activity (McKinlay, 1995).

Although most of McKinlay's (1993, 1995) writing

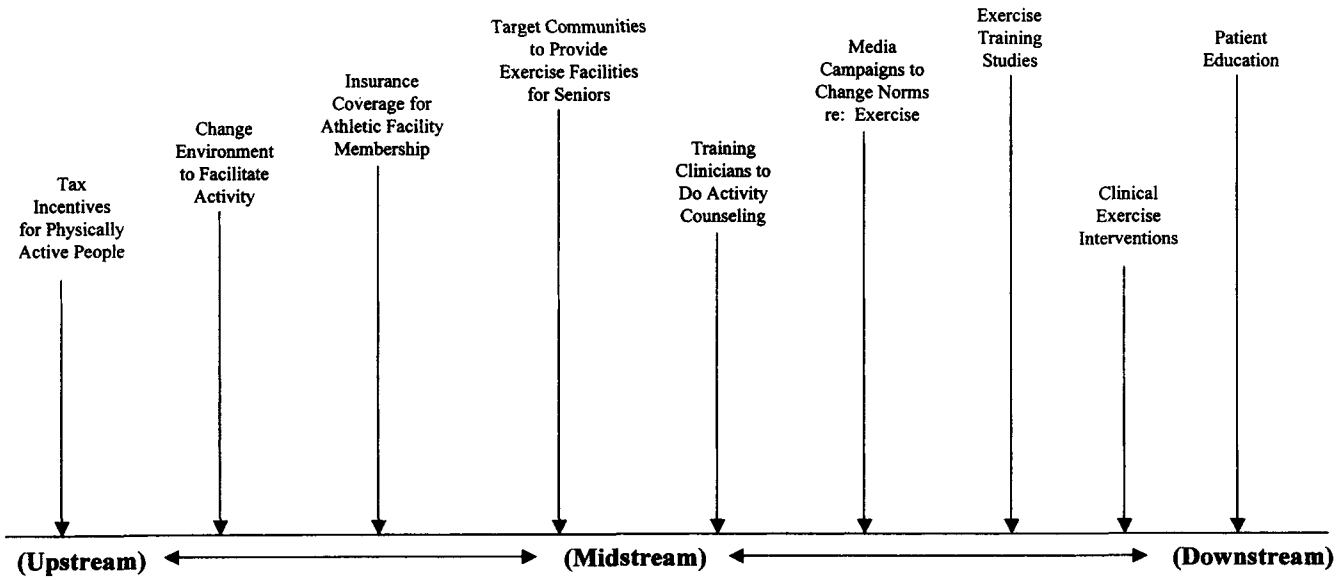

Figure 1. Application of McKinlay's (1995) model to improving physical activity and autonomy in older populations. From "The New Public Health Approach to Improving Physical Activity and Autonomy in Older Populations," by J. B. McKinlay, 1995, in E. Heikkinen, I. Ruoppila, & J. Kuusinen (Eds.), *Preparation for Aging* (p. 97), London: Plenum Press. Copyright 1995 by Plenum Press. Reprinted with permission.

focused broadly on *producing* health behavior change, the concern for *maintaining* these changes was central and implicit. In fact, McKinlay's model may apply even more directly to research and practice on maintaining sustained health behavior change than to producing initial short-term change. The papers presented at this conference, summarizing past research on maintenance and relapse prevention, have focused on the experiences of individuals who have participated in an initial behavior change or treatment program (Jeffery et al., 2000; Kumanyika et al., 2000; Marcus et al., 2000; Ockene et al., 2000). Such programs typically create a therapeutic micro-environment that is carefully designed to facilitate and reinforce desired health behaviors (i.e., complying with recommended eating and activity patterns, or using effective smoking cessation skills and strategies) and usually employ some type of stimulus control to protect people from the unhealthy influences and norms operating in the wider social environment (e.g., making high-fat and other high-risk foods harder to get, removing cigarettes, matches, and ashtrays, avoiding other smokers). Treatments typically end when initial changes have been achieved.

In short, current treatment approaches arm patients with behavioral self-control strategies, and then send them off into the larger social environment to maintain their treatment gains (with only as much ongoing counseling support as the current health care system will reimburse), leaving them at the mercy of a social system that encourages, rewards, and profits from at-risk behaviors (i.e., advertising a selling of high-fat foods, high-sodium foods, cigarettes, and other tobacco products) and from which normal forms of physical activity have been engineered out. It is therefore not surprising that most successfully treated individuals revert to their old high-risk behaviors within 6 to 12 months of treatment, or that the most successful treatment and maintenance strategies appear to be those that prolong the treatment microenvironment. This is often accomplished through continued therapeutic contact and supports, or environmental engineering (supplying individuals with diet-appropriate foods, or in-home exercise equipment), or for children, strategies that target parents and family members who control the in-home environment. It is also not a surprise that greater participation in the broader social environment (e.g., eating out more often) hampers maintenance (Jeffery et al., 2000; Kumanyika et al., 2000; Marcus et al., 2000; Ockene et al., 2000), especially for disadvantaged and low-income Americans. Returning to McKinlay's (1975) metaphor, our best current behavioral treatments function as life preservers on that "swiftly flowing river"—life preservers that seldom to hold up to more than 6 to 12 months of societal wear and tear.

Like other social–ecological models of health promotion and disease prevention (e.g., Green, Richard, & Potvin, 1996; McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1996), McKinlay's model has major implications for future research and practice on health behavior change maintenance. Developing a broader understanding of how social policy, environmental, and sociocultural influences affect health behavior change and maintenance and generating new theories and models that incorporate macro-level social environmental variables are required for more powerful interventions. Most of the cognitive–behavioral theories of health behavior change and maintenance, including relapse prevention or maintenance theories advanced by Marlatt and Gordon (1985), Niaura et al. (1988), and Prochaska and DiClemente (1983), could be readily expanded to encompass powerful social–environmental variables. Yet, these variables have not been systematically incorporated in past health behavior change or maintenance research.

For instance, the transtheoretical model, as one example of a population-based model, might be used to explore how social and policy influences interact with cognitive–behavioral self-change processes and interventions (Orleans, 1995). This is illustrated in Figure 2 using the example of tobacco control. Across the top of Figure 2 are listed the intrapersonal processes of change that Prochaska and DiClemente (1983) found to be the most important for each stage of change—precontemplation, contemplation, preparation, action, and maintenance and recycling. (The same processes are proposed for both the action and maintenance and recycling stages—reinforcement management, helping relationships, counterconditioning, and stimulus control.) Across the bottom of Figure 2 are listed a number of tobacco policy interventions that might promote or support these stage-specific change processes, including excise tax increases, smoking restrictions, worksite nonsmoking incentives, and efforts to maintain these influences by blocking tobacco industry countermaneuvers. However, in tobacco control and other areas, research examining such relationships is rarely done, and as a result we have limited knowledge about how macro-level policy interventions reinforce or interact with state-of-the-art motivational, smoking cessation, or maintenance treatments at the individual level (e.g., Brownson, Koffman, Novotny, Hughes, & Eriksen, 1995; Orleans & Cummings, 1999).

In sum, the application of McKinlay's model and similar social–ecological models of health promotion (e.g., Green et al., 1996; Sallis & Owen, 1997; Stokols, 1996) would enable us to do a much better job of defining, measuring, and evaluating pervasive environmental influences on which past research has been basically silent, and identifying upstream, environmental strategies that will enhance downstream interventions and promote long-term maintenance. One result would be an improvement in the typical individual-level outcomes achieved. Another would be the achievement of broader outcomes. As McKinlay (1995) explained it:

> Any reorientation of efforts to organizations, communities, or national policies requires the development of measurements and indicators appropriate to that upstream-level of focus. In contrast to measurements of individuals, system interventions must be assessed through the use of systemic outcomes, that is, how have you improved the community, independent of individuals and their risky behaviors. . . . The interest is not in whether an individual quits smoking or lowers his or her cholesterol, but whether there is improvement in the quality of the organizational environment, whether and how many restaurants add heart-healthy items to their menus, whether exercise facilities become available. (p. 100)

Including policy researchers, economists, ethnographers, sociologists, and social marketing experts on interdisciplin-

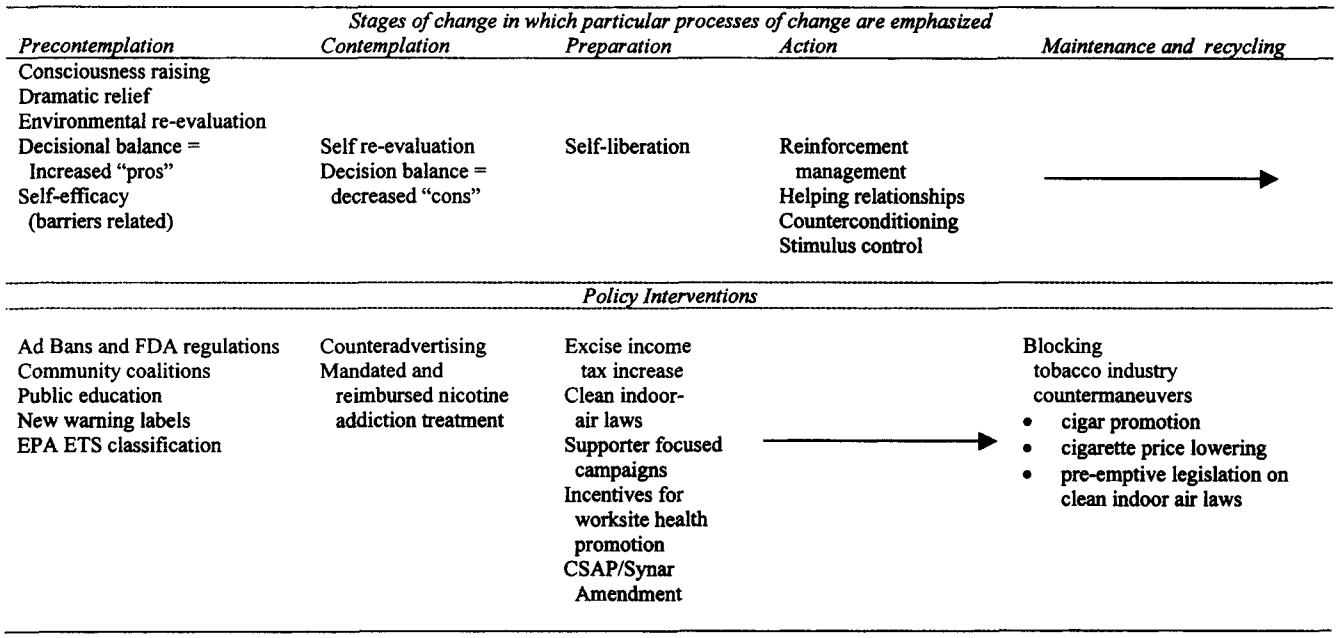

Figure 2. Potential impact of policy interventions on stages and process of change in smoking behavior, based on Prochaska and Diclemente (1983). FDA = Food and Drug Administration; EPA = Environmental Protection Agency; ETS = environmental tobacco smoke; CSAP = Center for Substance Abuse Prevention. From "Review of the Current Status of Smoking Cessation in the U.S.: Progress and Opportunities," by C. T. Orleans, 1995, *Tobacco Control, 4*(Suppl. 2), p. S7. Copyright 1995 by BMJ Publishing Group. Reprinted with permission.

ary teams studying maintenance processes and interventions could help to spur advances in this area.

Need for an Extended Model of the Maintenance Process

Most past research has tended to treat maintenance as a fixed or static state. This tendency dates back to one of the earliest and most generative models of the maintenance–relapse process—Marlatt and Gordon's (1985) cognitive–behavioral model of relapse prevention. Although Marlatt effectively used a "journey" metaphor to describe the process of change from initial behavior change to maintenance, he stopped short at maintenance, which he described as "the final destination" (Marlatt, 1985, p. 212). Newer formulations might take this metaphor further and describe maintenance itself as a journey. For instance, in their excellent review of relapse prevention for smoking cessation, Curry and McBride (1994) drew from Prochaska and DiClemente's stage model of change (e.g., Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992) to describe maintenance and relapse as "dynamic processes that may involve repeated cycles of abstinence and relapse" (p. 347). They accordingly recommended a shift in focus from relapse prevention to relapse management.

Such a shift could focus more attention on the kinds of data Ockene et al. (2000) present, highlighting the tremendous variability in patterns of slips and relapses following smoking cessation, and to the similar data Marcus et al. (2000) present, profiling the behavioral hills and valleys that characterize most people's efforts to maintain new patterns of physical activity. Such a shift also could lead to a sort of figure–ground reversal, placing a greater relative emphasis on processes of maintenance in contrast to processes of relapse, and could steer innovative efforts to develop effective maintenance promotion, versus relapse prevention strategies. In general, much more time and attention has been devoted to the study of factors associated with maintenance failures (including lapses and relapse) than to those associated with maintenance successes. Yet, it is quite possible that maintenance promotion involves somewhat different processes than relapse prevention, including the use of more generic, less risk-specific, coping, problem solving and environmental change strategies.

Naturalistic studies to further illuminate the motivations, skills, and supports that distinguish people who are successful long-term maintainers might address the following types of question posed during this conference:

1. Are different skills required for weight maintenance than for short-term weight loss?
2. Are the motivations, rewards, and costs associated with processes of losing weight different from those associated with maintaining the loss?
3. What are the greatest difficulties encountered as people move from the adoption to the maintenance of a new physical activity pattern, and are different intervention strategies needed?

4. Are different kinds of feedback needed to cue or reinforce maintenance behaviors among early maintainers than among more experienced, mature maintainers of any health behavior change?

Examples of such studies include promising work by Rena Wing and her colleagues to compile and study a registry of individuals who have achieved significant weight losses and maintained them for long periods of time (see Jeffery et al., 2000) and similar research tracking individuals enrolled in YMCA exercise programs (see Marcus et al., 2000).

There is much more to be learned as well from observational studies of the vast majority of people who seek to make and sustain healthy lifestyle changes on their own, without the benefit of formal treatment services. It is likely that individuals who change on their own need or employ somewhat different maintenance strategies than those who take part in formal treatment programs. With respect to preparing people for maintenance, formal treatments are likely to confer both advantages (e.g., imparting useful behavior change and relapse recovery skills) and disadvantages (e.g., fostering excessive dependence on treatment-supplied cues and supports). A better understanding of these advantages and disadvantages might lead to the identification of more effective low- and high-intensity interventions.

Need for More Theory-Based Research and for New Maintenance Theories and Research Paradigms

Perhaps the most fundamental requirement for breakthroughs in the understanding and improvement of health behavior change maintenance is that future research—whether naturalistic or controlled—must be designed to test or refine existing theories and models of the maintenance process, or to develop and test new ones. In their recent review of smoking cessation relapse literature, Curry and McBride (1994) concluded that "significant advances in the conceptual and empirical understanding of the relapse process have not been matched by major gains in relapse prevention interventions" (p. 361). Unfortunately, much the same could be said with respect to the maintenance of weight loss, physical activity, or dietary changes. Ockene et al. (2000) argue that this reflects the fact that too much of the recent research on relapse prevention and maintenance has been only loosely theory-based, with the result that existing models and theories have not been rigorously tested.

One consequence is that very little is known about the mechanisms responsible for the most effective maintenance strategies—including extended therapist contact, telephone support, home-based exercise options, or supplying appropriate foods in diet and weight loss programs. Without knowing more about how and why such interventions work, it is hard to improve upon them or to incorporate their essential elements into new strategies. Conducting exploratory research to gain a better understanding of these interventions represents a practical initial move in the direction of more theory-based research. For instance, after developing and testing the effective call-in smoking cessation hotline described by Ockene et al. (2000), Ossip-Klein and her colleagues (Ossip-Klein et al., 1991) queried hotline callers about the elements of the telephone counseling they found most useful and discovered that they placed highest value on the social support they received from the calls. In a similar effort, my colleagues and I conducted effect modification analyses to explore whether a similar proactive telephone helpline proved more effective for some smokers than for others (Orleans et al., 1991). Results showed that smokers who had never before tried to quit (and presumably were more in need of skill training) and those who lacked social support or lived with other smokers, or both (and presumably were more in need of social support), benefitted most. More studies like these could set the stage for further theory and hypothesis testing and methods development.

In addition, predominant maintenance theories may need to be updated, revised, or even discarded. For instance, Rimer (1997) has argued that behavioral medicine is suffering from a "hardening of the theories," and has recommended reinvigorating the science base through more diversity in theory and a greater emphasis on interdisciplinary biobehavioral research to clarify basic mechanisms. The area of health behavior change maintenance is no exception. Most of the models and theories driving current research and practice derive from cognitive–behavioral models of the relapse and maintenance process that were developed over a decade ago and have not been significantly revised or expanded since then (Marlatt & Gordon, 1985; Prochaska & DiClemente, 1983).

One strategy for expanding the current theoretical base is to integrate clinical cognitive–behavioral theories and intervention models from other relevant areas, such as motivational interviewing (Miller & Rollnick, 1991), goal setting (Locke & Latham, 1990), and new research in the areas of intrinsic–extrinsic motivation (Cameron & Pierce, 1994) and risk perception (Weinstein, 1989), and on the role of self-concepts and self-schema in health behavior change maintenance (Shadel & Mermelstein, 1996). Another is to conduct more interdisciplinary research, linking biomedical, behavioral, and policy perspectives to gain a fuller understanding of maintenance and relapse as dynamic processes involving the interaction of multiple individual influences (e.g., biological, behavioral, cognitive, motivational) and environmental or policy variables (e.g., ranging from those operating in the individual's immediate home and work environments to larger cultural, sociopolitical, and economic influences). Such research is needed to address questions such as the following:

1. How do the metabolic effects of dietary restriction and increased physical activity interact with motivational and behavioral processes to explain why the period of active weight loss is so often limited to six months?
2. How do metabolic, developmental, and psychosocial influences interact to produce the more favorable outcomes seen in family-mediated weight loss programs for youth?
3. How are the physiological, cognitive, and behavioral processes involved in weight loss or smoking cessation maintenance affected by the use of adjunctive pharmacotherapies, and what special interventions might apply?
4. What can the interactions of psychological and physiological variables related to taste and appetite tell us about

how to promote simultaneous change in the four dietary targets discussed by Kumanyika et al. (2000)?

Other Important Maintenance Research Questions

Issues related to reaching and assisting special populations deserve much more research attention. Highest priority should be given to the challenge of reaching and assisting economically disadvantaged populations with the highest prevalence of disease risks, including low-income, blue-collar, and ethnic–racial minority groups. Maintenance research and intervention must recognize these inequalities in the distribution of health and healthy behaviors, and address the environmental and biobehavioral factors responsible for them (e.g., Adler et al., 1994). More attention also must be given to the determinants of healthy behavior and health behavior change maintenance among children and adolescents. Nonhealthy populations, including people already suffering from cardiorespiratory disease, are likely to bring different motivations to the maintenance process and may be especially responsive to biological feedback of the harm caused by their risky behaviors and the health benefits of maintained behavior change (e.g., Gritz, Kristeller, & Burns, 1993).

Finally, it will be important to shift away from single-risk (one-risk-at-a-time) studies to multiple-risk studies that can examine the similarities and differences in health behavior change and maintenance strategies across different behaviors, as well as on synergistic or deleterious effects of attempting to maintain multiple health behavior changes at the same time. Such research could even be expanded to include work in other areas of maintenance (e.g., cancer screening, alcohol and drug addiction treatments, risky sexual behaviors). For example, Rakowski (in press), taking just such an expanded view, recently proposed a taxonomy of maintenance "demand characteristics," including the ease of finding substitute activities, the ability to delay gratification, tolerance for temporary discomfort, and preplanning and organizational skills.

Summary

Research on health behavior change maintenance deserves greater attention and resources. In contrast to interventions producing short-term behavior change, maintenance interventions do not appear to have improved significantly over the past 20 years, with the result that most existing maintenance interventions are not effective. Moreover, the models and theories driving maintenance research and practice have neither been rigorously tested nor updated to incorporate potentially powerful policy and macroenvironmental variables on the one hand, or more basic physiological variables on the other, with the result that even the most promising interventions are limited in impact and poorly understood. To move the field forward, we need (a) more comprehensive and social–ecological models of population-based health behavior change and maintenance (e.g., McKinlay, 1993, 1995; Sallis & Owen, 1997; Stokols, 1996), (b) a broader view of maintenance as a dynamic process rather than a static state or result, and (c) more theory-based research combined with efforts to reinvigorate the theories and paradigms guiding maintenance research and practice. In addition, greater attention must be paid to reaching and assisting special populations, and to multiple- (vs. single-) risk interventions.

One strategy that could address each of these needs would be to create and fund an interdisciplinary research network, made up of investigators representing differing research approaches and disciplinary perspectives, to focus on defining commonalities and differences in biopsychosocial maintenance processes and interventions across multiple cardiorespiratory risk factors (e.g., weight loss, diet, physical activity, tobacco) and address the major knowledge gaps. Linking biomedical, behavioral, and policy researchers, who typically work in separate spheres, holds great potential to clarify many of the basic change mechanisms involved in existing maintenance strategies. The cross-fertilization that would result could pave the way to the development of broader models and theories of the maintenance process and provide a rich foundation for the next generation of maintenance research and practice.

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