Risk = Hazard + Outrage

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In this chapter, we will cover:

- Differences between stage theories and other decision-oriented health behavior theories
- Description and justification of the Precaution Adoption Process Model (PAPM)
- Using the PAPM to understand and change behavior: The example of osteoporosis prevention
- How to test stage theories: General issues and the example of home radon testing
- Review of research using the PAPM
- Criteria for using stage-based interventions

To understand why many young adults put themselves at risk for AIDS, it was logical to investigate their beliefs about HIV and AIDS. A questionnaire based on popular theories of health behavior might ask a sample of young adults about the likelihood that they will have sexual contact with someone who is HIV positive, their chance of becoming infected by this person, the effectiveness of various precautions, the social consequences of taking such precautions, the behavior of their peers, and other topics like these.

This research strategy makes sense today. But what if the year were 1987, when the public was first learning about AIDS? At that time, some young adults might have been aware that AIDS is a fatal disease, but few would know anything more. In fact, they would be unable to answer most of your questions. The riskiness of their behavior would vary. Some young adults would have had many sexual partners; others would have had few or none; some would use condoms, and others would not. Yet, neither their current behavior nor subsequent changes in their behavior would be explained or predicted by their beliefs about AIDS. They had not yet formed such beliefs.

As this example shows, theories that try to explain health behavior by focusing on beliefs about costs and benefits of particular actions are relevant only to people who have been engaged sufficiently by the health threat to have formed such beliefs. Since this does not include everyone—and, with respect to HIV, included hardly anyone in 1987—there must be other stages (or phases) to precaution taking (i.e., actions taken with the goal of reducing the threat of illness or injury or of increasing the prospects for recovery). The Precaution Adoption Process Model (PAPM) seeks to identify all the stages involved when people commence health-protective behaviors and to determine the factors that lead people to move from one stage to the next.

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How Stage Theories Approach the1 Issue of Explaining and Changing Behavior

Many theories of individual health behavior, such as those focusing on perceived pros and cons of action, specify a single equation which they use to predict behavior. These theories acknowledge *quantitative* differences among people in their positions on different variables, and consequently, in their likelihood of action. The goal of interventions is to maximize the variables that increase the value of the prediction equation. Any action-promoting variable that has not already reached its maximum value is an appropriate goal for an intervention.

Advocates of stage theories, like PAPM, claim that there are *qualitative* differences among people and question whether changes in health behaviors can be described by a single prediction equation. They suggest, in effect, that we must develop a series of explanatory equations, one for each stage transition. This is a much more complicated goal than finding a single prediction rule, but it offers the possibility of greater accuracy, greater intervention effectiveness, and greater intervention efficiency.

Stage theories have four principal elements and assumptions (Weinstein, Rothman, and Sutton, 1998).

1. *A category system to define the stages* Stages are theoretical constructs. An ideal or "prototype" must be defined for each stage even if few people match this ideal. Stages can be useful even if the actual boundaries between stages are not as clear-cut as the theories suggest.

2. *An ordering of the stages* Stage theories assume that before people act, they usually pass through all the stages in order. However, forward progression is neither inevitable nor irreversible (cf., Bandura, 1995). There is no minimum length of time people must spend in a particular stage. In fact, people may sometimes progress so rapidly that, for practical purposes, they can be said to skip stages (for example, when a doctor recommends a new screening test and the patient agrees without any further deliberation). Some stages may lie on side paths that are not on the route to action. An example would be a stage representing people who have decided not to act. Obviously, people do not need to pass through stages on paths that do not lead to action.

3. *Common barriers to change facing people in the same stage* Knowing the stage of an individual or group is helpful in designing an intervention program only if people at that stage have to address similar types of issues before they can progress to the next stage. Thus, interventions can be tailored on the basis of stage, without having to investigate a wide range of potential tailoring variables.

4. *Different barriers to change facing people in different stages* If factors producing movement toward action were the same regardless of a person's stage, the same intervention could be used for

everyone, and the concept of stages would be superfluous.

A completely specified stage theory includes both criteria that define stages and factors that govern movement between adjacent stages. Although its stage definitions are meant to apply across behaviors, particular issues that constitute barriers to progress may be behavior- or hazard-specific. Factors that enter into decisions to lose weight, for example, may be quite different from those that affect decisions to use condoms. A model that proposes a particular sequence of stages in the change process could be correct about these stages even if it has not identified all the determinants of each transition from one stage to the next. At present, the PAPM does not provide detailed information about barriers at each stage. It is a conceptual framework or skeleton that needs to be fleshed out for each behavior with information about how stage transitions occur.

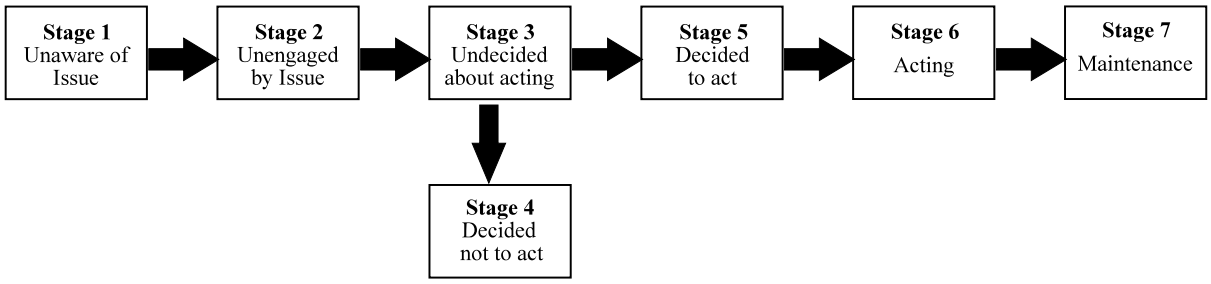
The Precaution Adoption Process Model

Description of the Model

The PAPM attempts to explain how a person comes to decisions to take action and how he or she translates that decision into action. Adoption of a new precaution or cessation of a risky behavior requires deliberate steps unlikely to occur outside of conscious awareness. The PAPM applies to these types of actions, not to the gradual development of habitual patterns of behavior, such as exercise and diet, in which health considerations may play little role (though it would apply to the initiation of a new exercise program or a new diet). Nor does the PAPM explain the commencement of risky behaviors—such as a teenager accepting her first cigarette--which seem to be better explained in terms of a "willingness" to act rather than in terms of any plan to act (Gibbons, Gerard, Blanton, & Russell, 1998).

Initial work on the PAPM was stimulated by Irving Janis and Leon Mann (1977) who tried to explain responses to threats by proposing discrete categories determined by people's beliefs about their capacity to cope with the threats. Like their work, the PAPM describes a set of categories (stages) defined in terms of psychological processes within individuals. All PAPM stages prior to action are defined in terms of mental states, rather than in terms of factors external to the person, such as current or past behaviors. Neither are PAPM stages defined in terms of criteria that are salient only to health professionals. PAPM stages refer to behaviors that are salient to laypeople, such as how often they eat red meat, rather than to criteria salient mainly to professionals, such as percentage of fat in a person's diet.

Figure 6.1 Stages of the Precaution Adoption Process Model



Although several aspects of the Precaution Adoption Process Model were first discussed in 1988 (Weinstein, 1988), the present formulation, published in 1992 (Weinstein and Sandman, 1992), differs in some respects from the initial version. The current PAPM identifies seven stages along the path from lack of awareness to action (see Figure 6.1). At some initial point in time, people are unaware of the health issue (Stage 1). When they first learn something about the issue, they are no longer unaware, but they are not yet engaged by it either (Stage 2). People who reach the decision-making stage (Stage 3) have become engaged by the issue and are considering their response. This decision-making process can result in one of three outcomes: They may suspend judgment, remaining in Stage 3 for the moment. They may decide to take no action, moving to Stage 4 and halting the precaution adoption process, at least for the time being. Or, they may decide to adopt the precaution, moving to Stage 5. For those who decide to adopt the precaution, the next step is to initiate the behavior (Stage 6). A seventh stage, if relevant, indicates that the behavior has been maintained over time (Stage 7).

The stages have been labeled with numbers, but these numbers have no more than ordinal values. They would not even have ordinal value if Stage 4 were included, since it is not a stage on the path to action. The numbers should never be used to calculate correlation coefficients, calculate the mean stage for a sample, or conduct regression analyses with stage treated as a continuous, independent variable. All such calculations assume that the stages represent equal-spaced intervals along a single underlying dimension, which violates a fundamental assumption of stage theory. Although not shown in Figure 6.1, movement backward toward an earlier stage can also occur, without necessarily going back through all the intermediate stages, although obviously it is not possible to go from later stages to Stage 1.

Two concrete examples, the stages relevant to home radon testing and to taking calcium for osteoporosis prevention, are shown in Figure 6.2.

Figure 6.2. Two Examples of the Stages of the Precaution Adoption Process Model: Home Radon Testing and to the Taking of Calcium to Prevent Osteoporosis.

Precaution Adoption Process Model: Radon Testing	Precaution Adoption Process Model: Calcium for Osteoporosis Prevention
Never heard of radon ⇓	Never heard of taking calcium to prevent osteoporosis ⇓
Never thought about testing ⇓	Never thought about taking calcium ⇓
Undecided about testing ⇓ ⇒ Decided not to test	Undecided about taking calcium ⇓ ⇒ Decided not to take calcium
Decided to test ⇓	Decided to take calcium ⇓
Testing ⇓	Started taking calcium ⇓
Not applicable	Takes calcium regularly

On the surface, the PAPM resembles another stage theory, the Transtheoretical Model developed by Prochaska, DiClemente, Velicer, and their colleagues (see Chapter Five). However, it is mainly the names that have been given to the stages that are similar. The number of stages is not the same in the two theories, and even those stages with similar names are defined according to quite different criteria. For example, the PAPM refers primarily to mental states whereas the TTM emphasizes days or months until intended action. We are not aware of any research directly comparing the two theories' predictions.

Justification for the PAPM Stages

There should be good reasons to propose the separate stages that make up a stage theory. What is the justification for the stages in the PAPM?

Stage 1 (unaware). Much health research deals with well known hazards, like smoking, AIDS, and high-fat diets. In such cases, asking someone about his or her beliefs and plans is quite reasonable;

most people have considered the relevance of these threats to their own lives. But if people have never heard of a hazard or a potential precaution, they cannot have formed opinions about it. The reluctance of respondents to answer survey questions about less familiar issues suggests that investigators ought to allow people to say that they "don't know" or have "no opinion" rather than forcing them to state a position. Participants in many health behavior investigations are not given this opportunity. Even when participants are permitted to say that they "don't know," these responses are often coded as missing or are collapsed into another category. To say "I don't know" indicates something important and is real data that should not be discarded.

Media often have a major influence in getting people from Stage 1 of the PAPM to Stage 2 and from Stage 2 to Stage 3, and much less influence thereafter. This and other factors that may be important in producing different transitions are given in Table 6.1 and in Weinstein (1988). These are suggestions for consideration, not core assumptions of the PAPM.

Table 6.1. Examples of Factors Likely to Determine Progress Between Stages

Stage transition	Factor
Stage 1 to Stage 2	Media messages about the hazard and precaution
Stage 2 to Stage 3	Media messages about the hazard and precaution Communications from significant others Personal experience with hazard
Stage 3 to Stage 4 or Stage 5	Beliefs about hazard likelihood and severity Beliefs about personal susceptibility Beliefs about precaution effectiveness and difficulty Behaviors and recommendations of others Perceived social norms Fear and worry
Stage 5 to Stage 6	Time, effort, and resources needed to act Detailed "how-to" information Reminders and other cues to action Assistance in carrying out action

Stage 2 (unengaged) versus Stage 3 (undecided). Once people have heard about a health precaution and have begun to form opinions about it, they are no longer in Stage 1. However, so many issues compete for their limited time and attention that people can know a moderate amount about a hazard or a precaution without ever having considered whether they need to do anything about it. This idea parallels a well-established finding with respect to mass media effects. The media are better at "agenda-setting"--persuading people that they ought to consider an issue and have an opinion about it

(i.e., moving from Stage 2 to Stage 3)--than they are at influencing the opinion itself, which tends to require more individual sorts of influences (see also Chapter Sixteen on Communication Theory).

We believe that this condition of awareness without personal engagement is quite common. In a 1986 survey of radon testing (Weinstein, Sandman, & Klotz, 1987), for example, 50 percent of respondents in a high-risk region said that they had never thought about testing their own homes even though all had indicated that they knew what radon was, and most had correctly answered more than half of the questions on a knowledge test.

The PAPM suggests further that it is important to distinguish between the people who have never thought about an action and those who have given the action some consideration but are undecided. There are several reasons for making this distinction. First, people who have thought about acting are likely to be more knowledgeable. Also, getting people to think about an issue may require different sorts of communications (and entail different sorts of obstacles) than getting them to adopt a particular conclusion. Thus, whether a person has or has not thought about taking action appears to be an important distinction.

Stage 3 (undecided) versus Stage 4 (decided not to act) and Stage 5 (decided to act). Research reveals important differences between people who have not yet formed opinions and those who have made decisions. People who have come to a definite position on an issue, even if they have not yet acted on their opinions, have different responses to information and are more resistant to persuasion than people who have not formed opinions (Anderson, 1983; Brockner and Rubin, 1985; Cialdini, 1988; Ditto and Lopez, 1992; Jelalian and Miller, 1984; Nisbett and Ross, 1980, Chapter 8). This widely-recognized tendency to adhere to one's own position has been termed "confirmation bias," "perseverance of beliefs," and "hypothesis preservation." It manifests itself in a variety of ways. According to Klayman (1995), these include: overconfidence in one's beliefs; searches for new evidence that are biased to favor one's beliefs; biased interpretations of new data; and insufficient adjustment of one's beliefs in light of new evidence. For these reasons, the PAPM holds that it is significant when people say that they have decided to act or have decided not to act, and that the implications of someone saying that they have decided not to act are not the same as saying it is "unlikely" they will act.

We believe that cost-benefit theories of health behavior, such as the Health Belief Model, the Theory of Reasoned Action, Protection Motivation Theory, and Subjective Expected Utility Theory, are dealing mainly with the factors that govern how people who get to Stage 3 decide what to do. Factors these theories focus on are certainly important, but they relate mostly to this one phase of the precaution adoption process. These theories also overlook another possibility, that people faced with a difficult decision might get stuck and quit trying to make up their minds, moving back to Stage 2. Determinants of this regression to an earlier stage might be different from the factors that lead people

toward Stages 4 or 5.

Perceived susceptibility (or, equivalently, "perceived personal likelihood") is one factor that can influence what people decide, and is included in most theories of health behavior (Connor and Norman, 1995). People are reluctant to acknowledge personal susceptibility to harm even when they acknowledge risks faced by others (Weinstein, 1987). Consequently, overcoming this reluctance is a major barrier to getting people to decide to act.

Stage 5 (decided to act) versus Stage 6 (acting). The distinction between decision and action is common to most stage theories. For example, Schwarzer's Health Action Process Approach (Schwarzer, 1992; Schwarzer and Fuchs, 1996) distinguishes between an initial, motivation phase, during which people develop an intention to act, based on beliefs about risk, outcomes, and self-efficacy, and the volition phase in which they plan the details of action, initiate action, and deal with the difficulties of carrying out that action successfully.

Even Ajzen's (Ajzen, 1985; Ajzen and Madden, 1986) Theory of Planned Behavior, which is not a stage theory, separates intentions from actions. Protection Motivation Theory is also not a stage theory, but its developers implicitly recognize the need for sequencing interventions. According to Rogers and Prentice-Dunn,, "PMT experiments always present information in the same order, threatening information followed by coping information" (Rogers and Prentice-Dunn, 1997, p. 116). These researchers also speak of first developing motivation and then developing coping skills.

A growing body of research (Gollwitzer, 1999) suggests that there are important gaps between intending to act and carrying out this intention, and that helping people develop specific implementation plans can reduce these barriers. The PAPM suggests that detailed implementation information would be uninteresting to people in early stages. Yet, for people who have decided to act, such information is often essential to produce the transition from decision to action. This claim is echoed by temporal construal theory (Trope & Liberman, 2003), which asserts that decisions about action are based initially on abstract construals of the options but become more focused on concrete event details when the actual choice comes near.

Stage 6 (acting) versus Stage 7 (maintenance). For any health behavior that is more than a one-time action, adopting the behavior for the first time is different from repeating the behavior at intervals, or developing a habitual pattern of response. Once a woman gets her first mammogram, for example, she will have acquired both more information in general and personal experience (perhaps positive as well as negative). These will play a part in the decision to be re-screened. Similarly, a man who stops smoking or loses weight must deal with the acute withdrawal experience and/or the glow of success in the early stage of taking action, but must address different challenges in the maintenance stage. The distinction between action and maintenance is widely recognized (e.g., Dishman, 1988; Marlatt and

Gordon, 1985; Meichenbaum and Turk, 1987).

Stages of inaction. One value of the PAPM is its recognition of differences among the people who are neither acting nor intending to act. People in Stage 1 (unaware), Stage 2 (unengaged), Stage 3 (undecided), and Stage 4 (decided not to act) all fit in this broad category. Those in Stage 1 obviously need basic information about the hazard and the recommended precaution. People in Stage 2 need something that makes the threat and action seem personally relevant. Individualized messages and contact with friends and neighbors who have considered action should help these individuals move to the next stage. Another powerful influence on the transition from Stage 2 to Stage 3 is probably the awareness that others are making up their minds, that one is obliged to have some opinion on this current issue of the day.

As stated earlier, people who have thought about and rejected action, Stage 4, are a particularly difficult group. Evidence shows that they can be quite well informed (Blalock et al., 1996; Weinstein and Sandman, 1992), and, as noted earlier, they will tend to dispute or ignore information that challenges their decision not to act.

Using the PAPM to Develop and Evaluate Behavior Change Interventions

Blalock and colleagues used the PAPM in three studies conducted from 1994-2000 that focused on osteoporosis prevention (Blalock, 2005, in press; Blalock et al., 2000; Blalock et al., 2002; Blalock et al., 1996). Osteoporosis is a metabolic bone disorder that results in decreased bone density and increased susceptibility to fractures (Riggs & Melton, 1986). Precautions recommended to reduce the risk of developing osteoporosis vary across the lifespan. However, adequate calcium intake and weight-bearing exercise are recommended for individuals of all ages ("Osteoporosis Prevention, Diagnosis, and Therapy," 2001). Their research was designed to better understand the factors that (1) discriminate among women in different stages with respect to calcium intake and exercise and (2) predict different types of stage transitions (Blalock et al., 1996; Blalock, in press). This information was used to develop stage-based educational interventions (Blalock et al., 2000; Blalock et al., 2002). These studies provide examples of the necessary steps in using the PAPM to develop and evaluate behavior change interventions These steps are outlined below.

The first step involves identifying and clearly defining the behavior of interest. Although the PAPM focuses on the adoption of specific health behaviors (e.g., “daily walking for at least 30 minutes”), it may also be used to intervene at a broader, behavioral category level (e.g., “increasing exercise”). In either case, care should be taken to define the target behavior(s) in terms that are meaningful to laypeople. Calcium intake is best considered a behavioral category (Blalock et al., 1996) because adequate intake may be achieved by a variety of specific behaviors (e.g., by the use of dietary

supplements or by increased intake of dairy products). Although Blalock and colleagues defined the target behavior in terms of a specific daily calcium intake, a value that has little meaning to most laypeople, they overcame this problem by providing study participants with feedback that informed them of their current calcium intake. This step would not have been needed if the behavior criterion had been simpler, such as "using a calcium supplement."

Second, a system must be developed to classify individuals according to their current stage. Especially if the target is a category of behaviors, it is necessary to decide what will constitute 'acting' and what will constitute 'maintenance.' Either or both may require a complex algorithm (e.g.: Doing A, or doing both B and C, or doing D at least three times). Most research using the PAPM has defined these two stages dichotomously, so that a person either is or is not 'acting.' Figure 6.2 provides examples that can help in the development of appropriate questions when the criterion is a simple dichotomy.

The stage classification system allows health professionals to assess the distribution of stages within a target population at a particular point in time, guiding the design of both individual and community-level interventions. As described in the AIDS example at the beginning of this chapter, if awareness and knowledge of a health threat change over time, the effectiveness of different types of interventions is likely to change as well. Thus, monitoring temporal changes in the distribution of people across stages makes it possible to design dynamic interventions that accommodate the dynamic nature of the behavior change process.

Third, it is necessary to have at least a preliminary understanding of the factors that influence different types of stage transitions. This understanding is needed to tailor interventions to people, or groups of people, who are in different stages of change. Early work by Blalock and colleagues (Blalock et al., 1996) suggested that to move people, or groups of people, from Stages 1 and 2 (unaware, unengaged) to Stage 3 (undecided), interventions should focus on increasing awareness of: the health problem of interest, behavioral recommendations to minimize risk, and potential benefits associated with adopting the behavioral recommendations – including the effectiveness of the recommended behaviors in terms of risk reduction (i.e., precaution effectiveness). In addition, the PAPM suggests that information must be presented in a manner that maximizes its personal relevance to the target group. Otherwise, awareness of an issue may increase, but engagement may remain low. As described earlier, many theories provide insight into the factors that influence transitions from Stage 3 (undecided) to either Stage 4 (decided not to act) or Stage 5 (decided to act). Interventions that focus on these types of beliefs may facilitate the transition from Stage 3 to Stage 5.

To increase the likelihood that individuals will be able to act upon their decisions (i.e., move into Stage 6 and 7), the work by Blalock and colleagues highlights the importance of reducing factors such as lack of skills or resources that may make it difficult to adopt the behavior of interest.

The cross-sectional and prospective research carried out by Blalock and colleagues searched for between-stage differences. Significant differences between stages on particular variables suggest that these variables are worthy of additional attention—and of inclusion in interventions at early stages of research—but they are not proof of causation. Furthermore, if interventions succeed in altering these variables but fail to move people to stages closer to action, this does not prove that the stages themselves are invalid. The variables that actually cause each stage transition must be identified empirically.

Fourth, intervention strategies are needed to address variables associated with different stage transitions. For example, media campaigns and informational materials may be able to increase awareness of a health problem, behavioral recommendations, and the benefits associated with action. However, more intensive interventions are often needed to help individuals acquire the skills and resources needed to support behavior change efforts. The intensity of the intervention required will depend on the behavior of interest and what barriers need to be overcome. For example, Blalock and colleagues used a combination of written materials and telephone counseling focused on helping women identify potential barriers to action and develop strategies to overcome the barriers identified. This approach led to a significant increase in calcium intake among women who were thinking about or trying to increase their calcium intake at baseline. However, a similar intervention focused on exercise had no effect on exercise level. These findings may not be surprising, because calcium intake is likely much easier to change than exercise level. Nonetheless, the findings underscore the importance of considering carefully the skills and resources needed to adopt the recommended behavior, and of including intervention components that address these needs.

Obviously, interventions should emphasize those barriers most relevant to the population of interest. Among smokers already interested in quitting, for instance, the early stages of the PAPM can be ignored. Yet, when a hazard is very new, such as West Nile Virus or Avian Influenza, few people will be ready to act. In such cases, interventions should focus on the earliest stages of the model.

Fifth, health educators must specify how the effectiveness of the intervention will be determined. Will it be considered effective if it results in stage progression, even if the proportion of people in the Action and Maintenance stages remains the same? Or, is success contingent upon behavior change in the target group? If a behavior is difficult to changes and people are in early stages, the PAPM suggests that a single, one-shot intervention—especially an intervention that focuses on movement to the next stage—should not be judged solely by whether it changes behavior.

Finally, educators and evaluators must determine the timeframe for follow-up assessments. The PAPM and other stage theories suggest that the behavior change process is dynamic. Intervention-induced changes in beliefs and behavior may be transient, so intervention effects may be missed if only long-term follow-up assessments are used. Although long-term behavior change generally is

desired, a stage model perspective raises the possibility that even transient changes may be steps in the right direction, helping us to understand the barriers at different stages and increasing the success of subsequent behavior change attempts.

How Stage Theories, Including the PAPM, Can Be Tested

A variety of approaches have been used to determine whether a particular behavior change passes through the sequence of stages proposed by a stage theory (Weinstein, Rothman, and Sutton, 1998). Many of these approaches have serious limitations. For example, a common but weak strategy is to use cross-sectional data from interviews or questionnaires to look for differences among people thought to be in different stages. Simply finding differences among people at different stages tells us little, however, since non-stage processes will also produce such differences. To reflect a stage process the variables that distinguish between people who are not in the same stage must differ depending on what stages are compared (e.g., the variables that differentiate between people in stages 1 and 2 must not be the same ones that differentiate between people in stages 2 and 3). A somewhat stronger approach would be prospective, measuring the stages that people are in and following up to determine which variables predict whether they took action or not.

Intervention research provides a much stronger test of theory. Experimental studies using matched and mismatched interventions are perhaps the best strategy for testing stage theories. If it is true that different variables influence movement at different stages, individuals in a given stage should respond better to an intervention that is *correctly matched* to their stage than to one that is *mismatched* (i.e., matched to a different stage). At the conclusion of the experiment, researchers employing such designs should consider providing full information about the precaution to participants in all conditions.

Stage models also predict that the sequencing of treatments is important. For maximum effectiveness, order of interventions should follow the hypothesized order of stages. Consequently, sequence effects provide further evidence of a stage process. Unfortunately, because testing for sequence effects requires sequential interventions, such tests are very difficult to carry out.

An Example Using Matched and Mismatched Treatments to Test the PAPM

A field experiment focusing on home radon testing (Weinstein, Lyon, Sandman, and Cuite, 1998) was designed to examine several aspects of the PAPM. Radon is an invisible, odorless, radioactive gas produced by the decay of small amounts of naturally occurring uranium in soil. Radiation from the decay of radon can damage cells in the lungs, and radon is the second leading cause of lung cancer after smoking (National Academy of Sciences, 1988; U.S. Environmental Protection Agency [EPA],

1992). Radon tests can be carried out by homeowners with a modest degree of effort; a single do-it-yourself test typically costs between $10 and $50.

The experiment focused on two stage transitions: from being undecided about testing one's home for radon (Stage 3) to deciding to test (Stage 5), and from deciding to test (Stage 5) to actually ordering a test (Stage 6). The study did not examine the transition from being unaware of the radon issue (Stage 1) to being aware but not engaged (Stage 2), or from being unengaged (Stage 2) to thinking about testing (Stage 3), because merely agreeing to participate in a radon study and answering questions about testing would probably be sufficient to move people to Stage 3. People who had already decided not to test (Stage 4) were excluded, because a brief intervention would have difficulty reversing that decision. Thus, while this example does not examine all features of the PAPM, it is a realistic example of how critical stages and stage transitions can be studied.

To determine whether the two transitions studied involve different barriers, as the theory claims, two interventions were used, one matched to each transition. Based on previous surveys and experiments (Sandman and Weinstein, 1993; Weinstein, Sandman, and Roberts, 1990), information about the local radon risk and rebuttals to myths of invulnerability were chosen as the focus of the intervention aimed at helping move people from Stage 3 to Stage 5. Interventions focusing mainly on risk had not been effective, however, in getting people to actually order tests (Weinstein, Sandman, and Roberts, 1990, 1991). Instead, several studies had found that test orders could be increased by increasing the ease of testing (Doyle, McClelland, and Schulze, 1991; Weinstein, Sandman, and Roberts, 1990, 1991). Thus, to move people from Stage 5 to Stage 6, the second intervention aimed at lowering barriers to action by providing information about do-it-yourself test kits and an actual test order form.

Method

The study took place in Columbus, Ohio, a city with high radon levels. To refresh their memories of the issue, all participants viewed a general informational video about radon before receiving any experimental treatment. Their stage of testing was assessed after this first video (preintervention measurement) using the algorithm in Figure 6.2.

After the first questionnaires had been returned, homeowners who were in Stage 3 or Stage 5 of radon testing were assigned at random to experimental condition and treatment videos were delivered to participants by mail. Participants in the High-Likelihood condition received a 5-minute video, *Radon Risk in Columbus Area Homes*, and an accompanying cover letter. The video focused on evidence of high local levels, pictures of actual local homes with high levels, testimony by a local homeowner and a city health official, and refutations of common myths about radon. The cover letter mentioned that test kits could be ordered from the American Lung Association (ALA), but did not include an order form.

Participants in the Low-Effort condition received a 5-minute video, *How to Test Your Home for Radon*, an accompanying cover letter, and a form to order test kits through the ALA. The video described how to select a kit type (making an explicit recommendation in order to reduce uncertainty), locate and purchase a kit, and conduct a test. The process was described as simple and inexpensive.

Participants in the Combination condition received a 10-minute video that combined the two separate treatments, along with the same letter and order form as people in the Low-Effort condition. Participants in the Control condition received a letter stating that their further assistance was not needed and thanking them for their participation.

Follow-up telephone interviews were conducted 9–10 weeks after respondents returned the second video questionnaires (follow-up measurement). Interviews assessed whether participants had purchased radon test kits and, if not, determined their final stages. The final sample consisted of 1,897 homeowners.

Table 6.2. Precaution Adoption Process Model: Stage Classification Algorithm

1. Have you ever heard about {home radon testing}?
   - No — Stage 1
   - Yes [Go to 2]
2. Have you {tested your own house for radon}?
   - Yes — Stage 6
   - No [Go to 3]
3. Which of the following best describes your thoughts about {testing your home}?
   - I've never thought about {testing} — Stage 2
   - I'm undecided about {testing} — Stage 3
   - I've decided I don't want to {test} — Stage 4
   - I've decided I do want to {test} — Stage 5

Note: The material in curly brackets can be replaced with other precautions to create a staging algorithm for these precautions.

Results

Predicting progress toward action. Table 6.3 shows the percentage of people from each pre-intervention stage who progressed *one or more* stages toward testing. This criterion (rather than progress of only a single stage toward testing) was chosen because although people who stopped at one stage were hypothesized to lack the requirements to get to the next stage, it seemed likely that some individuals would already possess the information or skills needed to overcome later barriers. The upper half of the table indicates the percentage of people at follow-up who had moved from the undecided stage to either the decided-to-test or the testing stage. The lower half of the table shows the

percentage of decided-to-test people who had moved on to the testing stage.

Table 6.3. Progressed One or More Stage Toward Purchasing a Radon Test (percent)

Preintervention stage	Condition			
	Control	High-Likelihood	Low-Effort	Combination
Undecided	18.8 (138)	41.7 (144)	36.4 (130)	54.5 (139)
Decided-to-test	8.0 (339)	10.4 (338)	32.5 (329)	35.8 (345)

Note: The group size in each cell is shown in parentheses.

Statistical analyses showed more people progressed from the undecided stage than from the decided-to-test stage, F (1, 1886) = 61.6, $p < .0001$. There also was more progress among those who received the High-Likelihood treatment than among those who did not, F (1, 1886) = 31.5, $p < .0001$. Most important, there was a significant stage by High-Likelihood treatment interaction, F (1, 1886) = 18.5, $p < .0001$, indicating that the High-Likelihood treatment was much more effective for undecided participants than for decided-to-act participants.

There was also a large main effect of the Low-Effort treatment, F (1, 1886) = 89.4, $p < .0001$. The stage by Low-Effort treatment interaction, F (1, 1886) = 5.9, $p < .02$, indicated that, as hypothesized, the Low-Effort treatment in the Low-Effort and Combination conditions had a relatively bigger effect on people already planning to test than on people who were undecided.

Predicting test orders. Radon tests were ordered by 342 study participants or 18 percent of the sample (see Table 6.4). For people already planning to test at the pre-intervention assessments, planning to test, "progress" and testing are the same according to the PAPM, so the data in the lower half of Table 6.4 are identical to those in the lower half of Table 6.3. As expected, there was more testing from the decided-to-test stage than from the undecided stage, F (1, 1887) = 42.3, $p < .0001$, and much more testing among people exposed to a Low-Effort treatment than from those who did not receive this treatment, F (1, 1887) = 87.9, $p < .0001$. Most important was the highly significant interaction between stage and Low-Effort treatment, F (1, 1887) = 18.2, $p < .0001$.

Table 6.4. Radon Test Orders (percent)

	Condition

Preintervention stage	Control	High-Likelihood	Low-Effort	Combination
Undecided	(a) 5.1	(b) 3.5	(c) 10.1	(d) 18.7
Decided-to-test	(e) 8.0	(f) 10.4	(g) 32.5	(h) 35.8

Eight more specific tests concern predicted cell-by-cell contrasts. In subsequent paragraphs, predictions are presented in brackets. Experimental groups are labeled with letters that refer to the cells in Table 6.4.

Test order rates of both undecided and decided-to-test participants in the Control condition were expected to be quite low since both groups were viewed as lacking information needed to progress to action [(a)≈(e), both small].

The Low-Effort treatment was expected to be much more helpful than the high-risk treatment in getting people who had already decided to test to order tests [(g)>(f)]. In fact, it was predicted that the High-Likelihood treatment would be ineffective in eliciting testing from people planning to test [(f)≈(e)], and, more obviously, unable to elicit test orders from undecided people [(b)≈(a)]. Furthermore, since people in the decided-to-test stage should not need further information about risk, it was predicted that testing in the Combination condition would not be significantly greater than testing in the Low-Effort condition [(h)≈(g)].

According to the PAPM, people who are undecided have to decide to test before acting. Consequently, a Low-Effort intervention alone was not expected to produce test orders from this group [(c)≈(a)]. Since undecided people in the Combination condition received both high-likelihood information and low-effort assistance, some of these people might be able to make two stage transitions [(d) > (c)], but not as many as decided-to-test people in the Combination condition who needed to advance only one stage [(d) < (h)]. Theories based on a single equation would not make detailed predictions like these, especially predictions that vary with initial stage. Furthermore, such theories would predict that the more ingredients in an intervention, the greater the response.

T-tests comparing means of cells mentioned in the preceding eight hypotheses demonstrated that none of the pairs predicted to be approximately the same were significantly different (p's > .3). All pairs predicted to be different were significantly different (all p's < .0001 except for the hypothesis that (d) > (c), p = .03).

Radon Study Implications for Theory

The radon study has several theoretical implications. First, it provides support for our claim that being undecided and having decided to act represent distinct stages, with different barriers to moving to the

next stage. Second, the data support the suggestion that information about risk is helpful in getting people to decide to act, even though this same information may have little value in producing action among those individuals who have already decided to act. Third, information that increases perceived and actual ease of action appears to greatly aid people who have decided to act, but it is less important among people who are still undecided. More research is needed to determine whether these same factors are important at the same stages for other health behaviors.

Acceptance of the idea that stages exist also has implications for theory development. If factors that facilitate movement toward action vary from stage to stage, few, if any, factors will be important at all stages. Thus, the standard approach of comparing people who have acted with everyone who has not will be a poor way to discover variables important for precaution adoption. In fact, when all who have not acted are simply lumped together in a single category, some stages may be missing or barely represented. In this case, it would be impossible to discover the role of a variable that might be crucial to people reaching or leaving this stage--and therefore crucial to the precaution process--but not relevant to other transitions. Stage theories suggest that we will be better able to identify important barriers if we compare people who are in adjacent stages.

If we had compared people who had tested for radon to all those who had not, we would have found many differences in beliefs and experiences, and we might have based our interventions on some of these. Yet, when we compared people who had tested with those who had decided to test but had not yet acted, we found almost no differences on these variables. This finding led us to explore the idea that factors external to individuals--especially matters of opportunity and effort--were responsible for getting people to move from intention to action. Much of our success in generating test purchases came from this idea.

Radon Study Implications for Practice

Effects produced by the radon testing experiment are large enough to have practical implications. Viewed in terms of test order ratios, the interventions created a three-fold difference in test orders between the undecided and decided-to-test stages in the Low-Effort condition and a ten-fold difference between cells with the highest and lowest testing rates.

Stage-targeted communications have never been used in actual radon testing promotions, and until relatively recently, had not been used for any health behaviors. The most widely disseminated radon communications, national television public service advertisements, have focused on persuading viewers that the radon hazard is substantial for people in general. To the extent that a target audience stage can be inferred, these public service advertisements appeared to be aimed primarily at viewers who are unaware of the radon problem (Stage 1) or had never thought about their own response (Stage 2). This was a defensible choice when the issue was new and the medium used (national television) was scattershot. But 20 years after radon first received substantial public attention, most radon

communication campaigns have retained the same focus, even though there is reason to think that much of the audience is beyond Stages 1 and 2.

Review of Research Using the PAPM

Types of Studies Conducted

The PAPM has been applied to many types of health behaviors, including osteoporosis prevention (Blalock, 1996, 2000, 2002, 2005, 2007; Sharp & Thombs, 2003), cancer screening (Clemow, Costanza, Haddad, Luckmann, White, Klaus, Stoddard, 2000; Costanza, Luckman, Stoddard, White, Stark, Clemow, & Rosal, 2005; Glanz, Steffen, & Taglialatela, 2007; Sifri, Chelmik, Hyslop, Cocroft, Rosenthal, & Myers., 2006) hepatitis B vaccination (Hammer, 1998), home radon testing (Weinstein, Lyon, Sandman & Cuite, 1998; Weinstein & Sandman, 1992; Weinstein, Sandman, & Klotz, 1986; Weinstein, Sandman, & Roberts, 1990, 1991), smoking cessation (Borrelli, McQuaid, Becker, Hammond, Papandanatos, Fritz, & Abrams, 2002), and red meat consumption (Sniehotta, Luszczynska, Scholz, & Lippke, 2005 As discussed earlier in this chapter, stage theories—with their numerous assumptions about stages and about the changing barriers between stages--are complex. Given the limited, though growing, number of studies relating to the PAPM and the variety of behaviors examined, it is not yet possible to reach firm conclusions about the model's validity or its helpfulness for designing interventions. Instead, this section reviews the ways in which the PAPM is being used and some of the problems researchers encounter in these investigations.

As is true for health behavior research in general, most articles reporting on the PAPM present cross-sectional data (e.g., Blalock, 1996; Clemow et al., 2000; Costanza et al., 2005; McClain, Bernhardt, & Beach, 2005; Sandman & Weinstein, 1993; Sniehotta et al., 2005), though a few describe longitudinal data (Blalock, 2007) or have conducted interventions with control groups (Blalock, 2000, 2002; Borrelli et al., 2002; Glanz, Steffen, & Taglilatela, 2007; Weinstein, Sandman, Lyon, & Cuite, 1998).

The degree to which these studies actually make use of ideas embodied in the PAPM varies tremendously. A few researchers (e.g., Edwards et al., 2006; Mauck, Ciddihy, Trousdale, Pond, Pankratz, & Melton, 2002; Sharp & Thombs, 2003) report the distribution of their study samples across the PAPM stages, but use neither stage ideas nor the PAPM in any other way. Other studies measure both people's stages and their standing on selected variables. Such studies compare values of these variables across stages—emphasizing pairs of stages that are adjacent in the PAPM—and look for significant differences. If the concern of such researchers is to test the validity of the theory, they search for variables that differentiate between some pairs of adjacent stages and not others (e.g., Sniehotta et al., 2005; Sandman & Weinstein, 1993). Differences between stages are viewed as possible barriers to stage movement, and the analysis responds to the claim that at least some barriers to movement differ from transition to transition. Other researchers are less interested in theory testing than in using the model to develop behavior change interventions (Clemow et al., 2000; Blalock,

1996). For them, variables that differ between stages become potential components of programs to encourage precautionary action.

Stage comparisons based on the PAPM do find many differences (e.g., Blalock, 1996; Clemow et al., 2000; Costanza et al., 2005; Sniehotta et al., 2005; Hammer, 1998; Sandman & Weinstein, 1993) and, further, find that the variables that distinguish one stage from another vary depending on which two stages are compared. These results support the claim that the PAPM stages are qualitatively different.

Intervention studies emphasizing behavior change base their treatments on variables that have differed across stages in prior research or variables mentioned as possible barriers in discussions of the PAPM (e.g., Blalock, 2000, 2002; Borrelli et al., 2002, Glanz, Steffen, & Taglialatela, 2007). Because these studies typically deliver the same treatment to all participants, regardless of stage, they make only limited use of stage concepts. The question they address is whether variables suggested by the stage model produce greater changes in behavior than the control condition (which could be a no-intervention control condition; a nonspecific, healthy-living control condition; or a treatment focusing on variables specified by other theories).

A more complete use of the stage character of the PAPM would be to develop stage-specific treatments and match treatments to participants' stages. Any of the three types of control conditions just identified might be used. Tto test the value of stage matching per se, the control condition could be a composite of stage-specific treatments. The most rigorous test of the model is the radon testing experiment described earlier in this chapter (Weinstein, Lyon, Sandman, & Cuite, 1998).

Problems and Issues

Interpretation of the PAPM. Perhaps because the very first version of the PAPM (Weinstein, 1988) distinguished among certain stages on the basis of individuals' beliefs about personal vulnerability, some researchers have interpreted the model as primarily focused on risk perception. This is incorrect. All later versions of the PAPM defined stages with in terms of mental states regarding the *health action* in question, not regarding personal vulnerability to harm. Another mistake is to view the variables in Table 6.1 as assumptions of the PAPM. Variables in the table are ones that the creators of the model believe may prove important. However, it is incumbent upon researchers to decide for themselves—from their own or others' empirical research or from other theories—which variables may determine movement from one stage to the next.

Interpreting and analyzing data. Differences between stages—in the perceived pros and cons of action, perceived susceptibility, self-efficacy, or other variables—might indicate that such variables are determinants of behavior change. But the change in stage may have produced the change in the variable, rather than the other way around (Weinstein, 2007). For example, since preventive measures are designed to reduce risks, the worry and the perceived vulnerability of people who have taken these

measures, their values are likely to be lower than those for people who have not acted. This should not be misinterpreted to mean that low perceived risk increases the likelihood of action.

A different problem arises when investigators combine stages before analyzing their data. This often occurs when they find small numbers of individuals in particular stages. Yet, the stages are claimed by the PAPM to be qualitatively different, so these composite categories contain mixtures of different types of individuals. To compare all the people who are not acting or intending to act (stages 1-4) with all those who intend to act or are already acting (stages 5-7), for example, ignores nearly everything that makes the PAPM different from nonstage theories, such as the theories of reasoned action, planned behavior, or protection motivation. It would be better to drop from analyses stages with few members.

Definitions of stages when health behaviors are complex. The PAPM, like most other theories of health behavior, maps most readily onto single health behaviors that are dichotomous, such as being vaccinated versus not being vaccinated. Many precautions, however, are more complicated. For example, sun protection and colorectal cancer screening can each be achieved by a variety of actions. Furthermore, some sun protection actions, such as wearing a hat, are dichotomous, but others, such as the amount of time one spends outdoors during peak sun hours, are continuous. Some precautions—such as wearing a hat and a long-sleeved shirt--complement one other, but others are mutually exclusive (if you stay out of the sun during high-risk times, you have little need to use sun screen).

In general, we recommend that researchers define stages in terms of concrete behaviors, such as wearing a hat, rather than in terms of broad health goals, such as "protecting oneself from the sun" or "eating a healthy diet." However, there are undoubtedly instances where people do focus on the overall goal (e.g., sun protection, low-fat diet, regular exercise) and treat the actions that can help them reach this goal as a menu from which they can make daily choices, rather than feeling that they have to make fixed decisions about whether or not to perform each separate action. In other words, people may decide to do *something*, or they may decide to do *specific things*. Thus, some people may decide to reduce their sun exposure—and adopt actions that may change from day to day—whereas others may focus on one action and decide to apply sunscreen each morning.

Another difficult question for users of the PAPM is whether to add stages that differentiate people on the basis of their past actions. For example, a person who quit smoking temporarily and is undecided about trying to quit again is, according to the model, placed in the same stage as a smoker who is undecided about quitting and has never tried to stop. Yet, the first person, having gotten to the point of making a quit attempt and having gained concrete experience from trying to quit, seems to be in a different position from the second. Do they need to be placed in different stages?

If someone has made only partial progress toward a goal—such as eating five servings a day of fruit and vegetables—should he or she be grouped with people who have made no dietary change or with people who consume the recommended five servings a day, or should there be a separate category of action underway but incomplete? And what of behaviors that need to be repeated, such as cancer screening, but at intervals that may range from a year to a decade? Since some of these behaviors may never become deeply engrained habits, perhaps the stage we have called maintenance will not apply.

Answers to questions about what stages provide the best explanation of precaution adoption cannot be derived from logic alone and must await the accumulated findings of careful empirical research.

Criteria for Applying Stage-based Interventions

A variety of issues should be considered to determine the practical utility of the PAPM or any other stage theory.

Superiority Over Unstaged Messages

The practical utility of a stage theory depends on the extent to which it leads to interventions that are more effective than generic messages.

For the radon testing study described here, we had to develop two different interventions. Since the combination treatment in our experiment produced the greatest progress among both undecided and decided-to-test participants, one might be tempted to conclude that the PAPM did not provide any new treatment ideas. "Just use the combination treatment," someone might say. There are several flaws in this reasoning. First, the combination treatment was about twice as long as each of its two components. Media time is expensive; speakers usually have a fixed length of time for their presentations; some people will not attend an educational presentation; and audiences have a limited attention span. Thus, attempting to replace the Low-Effort or High-Likelihood interventions with their combination would involve substantial costs.

Second, people are most likely to be engaged by a treatment that matches their stage, and a mismatched treatment may loose their attention. Thus, members of the general public who have already decided to act may be put off by risk information, and may fail to attend to the subsequent, detailed procedural information which they do need. Nevertheless, if only a single message can be given to a mixed-stage audience, the combination intervention would probably be the most appropriate.

Stage Assessment

A second relevant criterion is the ability to identify stages accurately and efficiently. The PAPM

requires only a simple process to assess a person's stage, so it can be used easily in individual and small-group settings. Clinicians could integrate this assessment without disrupting their practices. Similarly, a filtering question on a website can easily assess stage and send visitors to the page most relevant to their stage. Even in a large audience, a show of hands might be used to quickly determine the distribution of stages present. However, if the audience is dispersed, the budget is small, or time is tight, efforts to measure stage may be impractical.

Delivery of Stage-Targeted Messages

The feasibility of delivering stage-targeted messages in different situations varies greatly. If communication is one-on-one, as in a doctor's office or counseling session, delivering the message appropriate for an individual is relatively easy. In group settings, such as public lectures, messages can be chosen to fit the overall audience, though not individual members. In mass communications, a stage approach is more often practicable with print than with broadcast media. Within print channels, pamphlets and magazines offer more opportunities for stage targeting than newspapers; within broadcasting, cable offers more opportunities for stage targeting than networks. The Internet makes it possible for individual users to choose different information pathways depending on their self-perceived information needs. This should provide unprecedented opportunities for low-cost message targeting, though evidence on the cost of such tailored messaging is scanty. There is evidence, though, that people in different PAPM stages do perceive themselves as needing different types of information (Weinstein, Lyon, Sandman, & Cuite, 1998).

The ability to deliver targeted messages to members of a group also depends on the range of stages present in that group. The greater the range of stages, the more difficult it is to choose a single message. For a mass audience, the most efficient way to encourage a new health-protective action may be with a comprehensive broadcast message that ignores stage or assumes everyone to be at a very early stage. As the issue matures, however, distinctive audiences, separable by stage, merit distinctive messages, and print or "narrowcasting" becomes the medium of choice for mass communications.

The Difficulty of Behavior Change

A final criterion of importance concerns the difficulty of the action being advocated and the expected resistance of the audience to the behavior change recommendation. When a behavior is easy and resistance is low, stage may matter little. In such situations, interventions and messages needed to help people progress from stage to stage can be brief, and several may be combined into a single comprehensive treatment. In contrast, when change is difficult and resistance is high, there is a greater need to have separate messages for each stage. Note that although some precautions—such as changing to a fluoride-containing toothpaste—are clearly easy to carry out, the ease of others may vary greatly from one person to the next. Health professionals should never assume that a behavior is easy without considering carefully the obstacles that may exist.

Radon testing appears so easy, and radon test kits so accessible, that it comes as a surprise to many professionals that there is any need for an effort-reducing intervention. Even apparently simple actions may raise questions that need to be answered before people feel confident they can carry out the behavior successfully. Actions often seem much more difficult to the public than to professionals. Some types of lifestyle changes--exercise, smoking cessation, dietary change, cancer screening, and others--are genuinely difficult or frightening for many people, and it is hard to convince audiences that action is needed. In cases like these, matching interventions to stage would be expected to matter more.

Conclusion and Future Directions

Most other (non-stage) theories of individual health behavior regard adoption of new precautions as involving only one step: from inaction to action (or, perhaps, inaction to intention), and the variables typically claimed to produce this step clearly characterize it as a judgment about the relative costs and benefits of action. The PAPM does not reject the variables identified by these theories. Rather, it sees the theories as describing just one part of the precaution adoption process, the stage when people are actively weighing options and deciding what to do. The PAPM, however, shows that other issues important to behavior change arise before people ever think seriously about action and still different issues arise after people have decided to act.

Because the PAPM is not comprised of a short list of variables, it does not offer a simple process for designing interventions. Rather, it is a framework that can be used to identify barriers that inhibit movement from one stage to the next. As additional research is conducted, we will learn more about barriers at each stage and will see how consistent these barriers are from one health behavior to the next.

Summary

This chapter describes the Precaution Adoption Process Model (PAPM), a stage theory that seeks to explain the adoption of new health-protective behaviors. The model asserts that progress toward behavior change is best explained in terms of a sequence of qualitatively different stages. These are named, “unaware,” “uninvolved,” “undecided,” “decided to act,” “acting,” and “maintaining action,” plus a stage “decided to act” that is a branch away from action. The barriers impeding progress toward action vary depending on what stage people have reached. The characteristics of stage theories are explained, as well as ways they can be tested. The chapter contains a review summarizing the ways in which the PAPM has been used, and it includes detailed examples from osteoporosis prevention and home radon testing.

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