

# 7

## Dietary Behaviors: Promoting Healthy Eating

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### LEARNING OBJECTIVES

- Barriers to dietary behavior change are present at the individual, social, and environmental levels. For each level, list at least two barriers commonly identified.
- Describe why the distribution of educational materials alone is unlikely to promote change in eating behaviors.
- Understand the relevance of behavioral theories and constructs in the promotion of eating behaviors.
- List three behavioral approaches used in patient-centered counseling to promote changes in eating behaviors.

Current dietary intake patterns in Americans have been well described. The recurring NHANES data (National Center for Health Statistics, 2012; [www.cdc.gov/nchs/nhanes.htm](http://www.cdc.gov/nchs/nhanes.htm)) based on self-reported dietary intake suggest that Americans are, on average, consuming diets incongruent with the Dietary Guidelines for Americans (2012) ([health.gov/dietaryguidelines](http://health.gov/dietaryguidelines)). Specifically, intake of dietary fat, saturated fat, sodium, and sugar-sweetened beverages and not including fiber, fruits and vegetables, and omega-3 fatty acids (USDA, *What we eat in America*; [www.ars.usda.gov/Services/docs.htm](http://www.ars.usda.gov/Services/docs.htm)) are well above what is estimated to be optimal for health. Further, dietary components whose greater intake is thought to be important for health are consumed well below estimated requirements. The resultant dietary patterns suggest poor eating behaviors predominant in the American diet. Alarming, these patterns have persisted for several decades and are a major contributing factor in the current epidemic of overweight/obesity and obesity-related chronic diseases such as diabetes, cardiovascular disease, as well as several cancers (Centers for Disease Control and Prevention, 2012; [www.cdc.gov/chronicdisease/index.htm](http://www.cdc.gov/chronicdisease/index.htm)). This disconnect between what we select to eat and the strong and well-substantiated risk for disease when less healthy food selections are made has led to a resurgence in interest to more thoroughly explore eating behavior. Furthermore, behavioral counseling remains a central therapy to reduce the burden of chronic disease in U.S. adults (Lin et al., 2010). Food choices are complex and

represent a variety of motivational factors ranging from taste/satisfaction, to psychosocial distress, to health, thus making absolute and sustained change challenging.

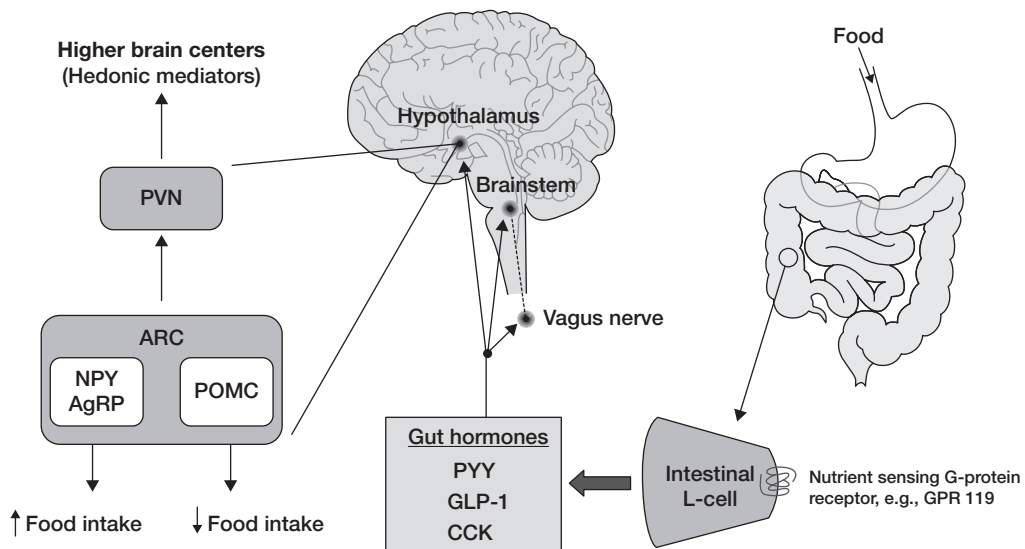
Importantly, humans must eat to survive and be healthy; thus avoidance is not a sustainable approach to positive eating behavior change. Eating behaviors require multiple choices repeated on a daily if not hourly basis. Each stimulus to eat from hunger, to visual cues, to smells or taste, most commonly acts to promote greater intake of food. The increasing abundance and availability of food also have promoted greater intake over time. But beyond the abundance and repeated exposures, research has suggested that the decision to select healthier less energy dense foods is both biological and behavioral.

This chapter serves to inform approaches to dietary behavior change by briefly reviewing the biology of eating; reviewing relevant behavioral theories, constructs, and strategies that have been effectively applied for changing eating behaviors; as well as exploring modification of the environment to promote healthy eating behaviors. The content is largely focused on individual behavior change; however, increasingly there is awareness that policy and population-level change also will be necessary in order to achieve the magnitude of sustained change in eating behavior necessary to make wellness a reality at the population level.

### THE BIOLOGY OF EATING BEHAVIOR

The drive to consume energy is largely driven by paracrine, endocrine, metabolic, and hormonal signaling pathways (Sam, Troke, Tan, & Bewick, 2012; Wren & Bloom, 2007). To a lesser extent, diurnal variations in hormones such as estrogen also can influence energy consumption as can thermal influences such as fever and the rise in core temperature with intense physical activity. Figure 7.1 illustrates several of the key regulatory factors within the brain, orosensory system, and gastrointestinal tract that regulate intake. While the human body has sophisticated regulatory feedbacks to optimize energy control, it is clear that behavioral factors can have a profound impact on these

FIGURE 7.1 Biology of eating behavior. (Adapted from Sam, et al. 2012)



systems, particularly within the human brain and gastrointestinal tract. Further, the heterogeneity of the biological influences on eating behavior at the individual level suggests that behavioral therapy to promote changes in eating behavior will have highly variable responses as is consistently demonstrated in practice and clinical trial research.

## THE BEHAVIOR OF EATING

Beyond biology, there is a significant and not fully understood role for behavior in food choices. Behavioral influences on intake include conditioned responses such as food preferences, aversions, and satiations as well as cognitive behavioral factors such as social, cultural, and esthetics. In addition, ecological influences such as relative densities and nutrient drivers also must be considered when examining the role of behavior on dietary choices. To illustrate in a more applied way, behavioral influences include a variety of factors such as stimulus response (e.g., chocolate as a “comfort food”), knowledge (e.g., consume calcium-rich dairy for bone health), social influences (e.g., mom said eat your vegetables), behavioral norms (e.g., daily lattes), role modeling (e.g., grandpa always avoided salt), aversions/attitudes (e.g., olives make me ill), and even reinforcement (e.g., coffee, beer taste wonderful).

Approaches to help individuals modify their eating behaviors, generally in an effort to support attainment of the Dietary Guidelines for Americans or some adaptation thereof, require behavioral treatment or other interventions. The distinguishing characteristics of behavioral treatment have been described by Foster and colleagues (Foster, Makris, & Bailer, 2005). Specifically effective behavioral treatment as it relates to eating and other behaviors must be goal directed, process oriented, and advocate for small rather than large change. Frequently the approach will integrate multiple components from self-monitoring to stimulus control, to cognitive restructuring.

## INDIVIDUAL DIETARY BEHAVIOR CHANGE

Individual behaviors surrounding food choices may reflect personal health behavior, health-related behavior change, or health (dietary) protective behavior. Personal health behavior reflects food choices made that result in a direct effect on the individual’s health. These behaviors may or may not be driven by a desire to improve one’s health as food choices are more commonly the result of taste, habits, availability, beliefs, and attitudes that may indirectly alter health status despite the original or primary motivational factor driving the eating behavior. Health-related behavior change differs from personal health behavior as it captures behaviors of others that indirectly improve the target individual’s health status. This would include behaviors of friends, family members, or perhaps even administrators and policymakers that affect the eating behavior of others. Health protective eating behaviors are behaviors that are undertaken with the primary, if not the sole intent, of improving a specific health indicator (e.g., serum cholesterol, blood pressure, etc.) whether it is risk for disease or control/treatment of disease.

At the individual level, changing dietary behaviors have historically relied on trained professionals (registered dietitians, medical doctors, registered nurses, etc.) who provide some specific facts or knowledge for the individual using an advice-giving mode in an attempt to elicit the desired change. While this approach in a small percentage of individuals may result in modest improvements in food choices to support health, there is a significant body of literature demonstrating that these approaches to behavior change fail in terms of magnitude of change needed as well as duration of

**TABLE 7.1 Barriers to Change in Eating Behaviors to Achieve Recommended Diet Intake Patterns for Optimal Health**

Individual	Lack of knowledge
	Financial/food insecurity
	Lack of or limited motivation
	Low perceived risk; insufficient benefit
	Hunger
	Taste
	Lack of awareness; mindfulness
	Habituation of food intake
Social	Cultural norms
	Holiday or religious practices
	Family composition/social isolation
	Meals consumed at home or away from home
	Shared meal environment
Environmental	Lack of social support for healthy behaviors
	Food accessibility; lack of supermarkets
	External stimulus; media
	Frequency of food exposures
	Quality of food exposures

change realized. Individuals trained in Behavioral Medicine are not surprised by these results in that these approaches often fail to engage the patient/client in the decision-making process or to ensure that the patient/client has made a conscientious effort to determine the value of specific dietary behavior changes in the context of their own risk–benefit evaluation. Yet these approaches are broadly applied even in current health care practice. A more productive client-centered approach that engages the client in developing plans and motivation for change has been demonstrated to be effective (Ockene et al., 1999). Beyond imparting knowledge and engaging the client, efforts also have been undertaken to identify barriers to making healthy food choices. Table 7.1 lists several of the more commonly reported barriers for which plans to reduce or remove the barrier may support positive changes in eating behavior. Again, reducing or removing barriers while shifting the risk–benefit ratio may or may not promote the magnitude and sustained change in eating behavior being sought.

### Habituation as a Determinant of Food Intake

Epstein and colleagues have recently suggested that habituation of food intake is an important determinant of food selection and thus may be an important determinant of resistance to change in food choices (Epstein, Temple, Roemmich, & Bouton, 2009). Food intake, in this context, is the result of repeated exposure to orosensory cues that drive the decision to eat. These same cues also may drive decisions related to stoppage of eating and thus also contribute to an individual's propensity toward obesity. To dishabituate a behavior is challenging in that it requires both an awareness of the habit and cues stimulating a specific eating decision and also the capacity to alter or over-ride these

habit-associated cues in an effort to make a different decision around the food behavior. To dishabituate, stimuli will need to be removed or altered. For example, food consumption is positively associated with television viewing time (Sisson, Shay, Broyles, & Leyva, 2012), particularly when combined with the availability of unhealthy snacks in the home (Pearson et al., 2012). Thus, setting a short-term goal to avoid visual stimuli from electronic sources overall and perhaps particularly during meal times will likely promote a reduction in intake. Other stimuli that should be considered include, for example, who the meal is shared with, time of day, smell of the food, visual access to the food, and related factors that may promote what has been labeled as “mindless eating” (Ogden et al., 2013; Wansink, 2010).

## PROMOTION OF HEALTHY EATING BEHAVIORS

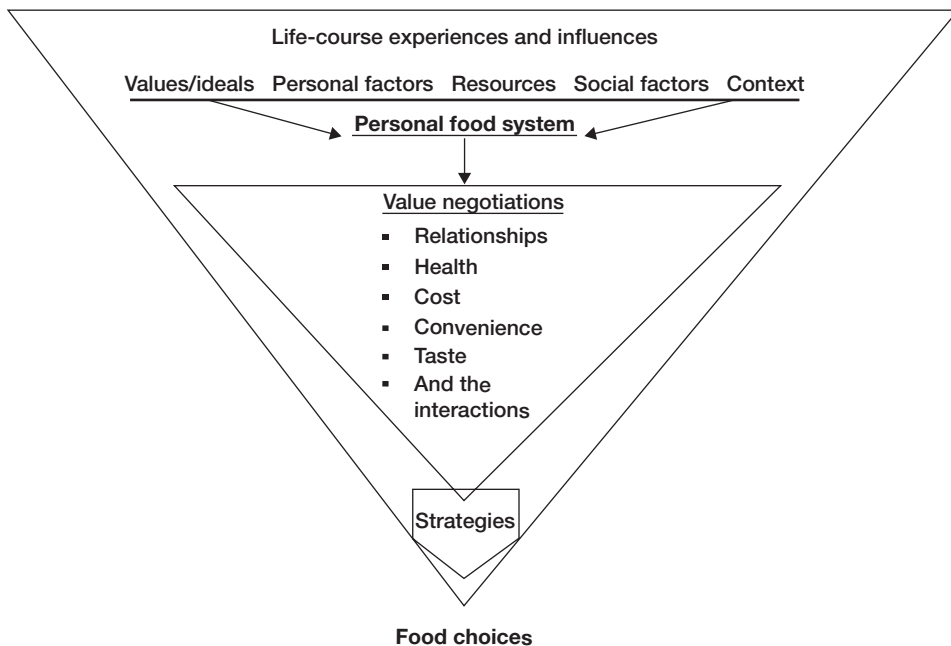
### EDUCATION

There are several approaches to behavioral change. Commonly, health care providers employ one-way delivery of information, or education, in an attempt to help patients/clients change eating behavior. For example, clinicians may provide dietary handouts explaining how to reduce dietary fat, salt/sodium, or even portion sizes. Lack of information is a barrier to effective change in dietary behaviors and evidence exists to suggest that filling knowledge gaps can enhance diet change toward healthier food choices as was the case for the nutrient-rich foods consumer education program for adult primary food shoppers (Glanz et al., 2012). Many times these materials are printed in mass without formative work to determine patient understanding, interpretation, and/or ability to employ the information to change their dietary behavior. In some cases, the materials are not adapted for cultural norms or expectations or may reflect a relatively verbatim translation without modification for cultural context. Seldom is health literacy evaluated during the development of the educational handouts resulting in educational handouts that frequently include medical terminology, mathematical computations, and reading levels that are beyond the literacy level of the target population. Further, this unidirectional approach is unlikely to be effective given the complexity of eating behavior and the multiplicity of factors that contribute to the individual’s risk-to-benefit assessment that can lead to significant changes in food choices. In particular, dissemination of information without application of behavioral theory is likely to ignore important psychological, social (inter- and intrapersonal), environmental, cultural, and even economic constraints. Importantly, even if the information provided through education fills a gap in the patient/client’s knowledge, there is limited evidence that education alone impacts behavior change in relation to achieving complex eating goals.

### BEHAVIORAL THEORIES AND CONSTRUCTS

A number of behavior change theories have been applied to dietary behavior. Commonly applied theories and constructs are described below (see Chapter 1 for a more in-depth discussion of these theories). But dietary behavior is not only complex in terms of the individual decision to eat or not eat a given food item; this decision-making process is repeated multiple times throughout a day and continuously in an individual’s lifetime. Theories developed to help individuals change eating behavior must consider multiple factors at the individual, social unit, and population level that influence and inform each decision to consume or not consume food. Figure 7.2 illustrates the complexity of these interacting influences on eating behavior.

**FIGURE 7.2 The Food Choice Model. (Adapted from Furst, Connors, Bisogni, Sobal, & Falk, 1996; Sobal & Bisogni, 2009)**



### Health Belief Model

The Health Belief Model can be effectively used to promote eating behavior particularly among individuals who have true elevated risk for disease. Cues that promote eating behavior change under this model include when an individual experiences a family member or close friend diagnosed with a disease, sees a media campaign or report suggesting disease risk, or is notified by a health care provider that risk is elevated. This theory suggests that first an individual must feel personally threatened or susceptible to a disease and second the individual must believe that the benefits of taking action outweigh the risks. When promoting eating behavior change using the Health Belief Model, interventionist and health care providers should consider both how change in behavior can be incentivized to increase the benefit beyond reducing health risk alone and/or target risks of dietary behavior change along with self-empowerment strategies to build the patient/client's capacity to manage the necessary change in diet. The challenge with this theory of behavior change is that health beliefs are only one influence on eating behaviors so that perceived risk must not only be heightened above other influences it also must remain heightened over other influences (cultural, social, and personal) over time in order to sustain the behavior change. Individuals who are commonly considered appropriate for whom to employ health belief models of dietary behavior change include cancer survivors and their family members, and individuals with newly diagnosed metabolic syndrome, pre-hypertension, or perhaps premalignant lesions (adenomas, abnormal mammography, and actinic keratosis).

### Social Cognitive Theory

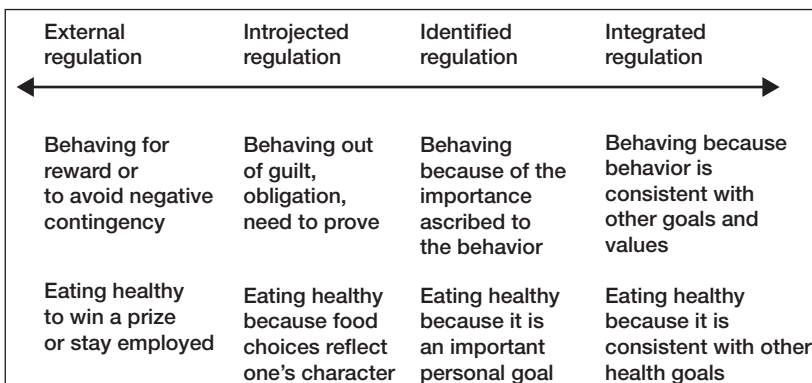
Social Cognitive Theory builds on the interaction between personal factors and the environment suggesting that both influence each other leading to reciprocal causation

in relation to eating behavior. In this model, eating behavior is thought to be a function of modeling or observed learning which is then reinforced to promote self-efficacy. Individuals learn how to make a specific dietary behavior change through observation and experiential learning (e.g., cooking demonstration, grocery store food purchasing trips, and role playing). As the individual practices the modeled behavior and increases awareness of the expected outcomes, self-efficacy is increased and eating behavior changes are effectively made. In this approach to dietary behavior change, it is important to consider significant others who play an active role in modeling the behavior of choice as well as environmental factors that may need to be considered to promote self-efficacy.

### Social Determination Theory

Social Determination Theory (SDT) is an integration of other theories into a larger context and is based on the premise that reinforcement and environmental contingencies are highly effective in influencing behavior, but must remain in effect for behavior to be sustained. Both the person/personality in relation to motivations and self-regulation as well as the situation or social context motivate behavior. This theory considers four regulations for the continuum of extrinsic motivation as shown in Figure 7.3. Counseling that applies SDT will likely initiate with autonomy supportive behaviors that address the patient's current perspectives and emotions, followed by problem solving, identification of patient aspirations in relation to goal setting, and in follow-up, the integration of competence support (Deci & Ryan, 2012). For example, a patient may be entering the diet counseling session for hypertension control but be overwhelmed with a new job. This issue should be acknowledged and emotions addressed, followed by a transition to the focus of the counseling, determining the patient's aspirations and thus longer term goals for dietary health, and then problem solving perhaps around short-term goals for healthy choices in the new work environment, behavioral efforts that can then be re-evaluated to promote self-efficacy over time within future counseling sessions. SDT applied to health behavior counseling to complement behavioral change promoted through motivational interviewing (Patrick & Williams, 2012), which is a patient-centered approach to help individuals develop motivation to change a behavior (Miller & Moyers, 2007).

**FIGURE 7.3** Social determination theory as it applies to healthy dietary behavior change (Patrick & Williams, 2012).





### **Transtheoretical Model: Stages of Change**

The Stages of Change Model for dietary behavior change has been employed in several dietary intervention studies. This model suggests that behavior change involves a sequence of “events” or stages that build toward sustained behavioral change. These stages include: (1) pre-contemplation during which a person is not aware, has not considered, or may be in denial about the needed behavior change, (2) contemplation wherein something happens to increase awareness and while there is some ambivalence regarding the dietary behavior change the person now has an awareness of the need for change, (3) preparation or the point at which the person actively gathers information to assess the costs and benefits of behavior change, followed by (4) action wherein the behavior is now being practiced using prior experiences, information, new skills, and motivation, and finally, (5) maintenance during which the dietary behavior is now practiced consistently and is somewhat habitual. The Stages of Change Model is sometimes applied to screen patients for eligibility in interventions or dietary change programs wherein individuals must be at the contemplation or preparation stage to be considered for program entry.

### **Theory of Diffusion of Innovations**

While this theory is not solely applicable to dietary change, it does have a clear application in this context. This theory notes that behavior change is about the compatibility of the innovation with an individual’s economic, sociocultural, and philosophical values. Several factors influence the adoption of the new behavior including the complexity, flexibility, relative advantage over current methods, cost-efficiency, and risk. Diffusion of Innovations Theory suggests that people fall into categories such that some can be described as innovators, those who develop new approaches, others are early adopters of the innovations, the majority adopt the behavior once the innovation is more diffused within the culture, and finally laggards are those who are resistant to the innovation. This theory probably has its greatest relevance to the use of e-technologies to promote dietary behavior change. Knowing an individual’s “category” related to new technologies will help to determine the most appropriate plan for integrating innovations into behavior change strategies. For example, a patient/client who is resistant to writing down their daily food intake to self-monitor may be challenged and excited by the use of a smartphone application to achieve the same goal. Being aware also will ensure greater adherence. For example, if a patient is instructed to cook vegetables in the microwave and they have yet to adopt the microwave as a cooking method, they may not adapt your advice to another cooking technique and instead not eat the vegetables. In the end, they are unsuccessful in achieving the eating behavioral goal.

## **BEHAVIORAL APPROACHES TO PROMOTION OF DIETARY CHANGE**

### **Goal Setting**

Goal setting is an important component of dietary behavior change. Goals can not only provide the necessary clarity regarding the structure, specificity, and expected outcomes, they also support self-efficacy over time. Goal setting should include both short- and long-term goals. Short-term goals, if achieved, should promote the eventual achievement of long-term goals as well. Short-term goals need to be specific to be effective in promoting the desired behavioral change and generally are written with the patient/client in an effort to individualize the goal to address barriers identified that



may hinder a person's success in achieving a goal. For example, a short-term goal to eat vegetables every day is unlikely to be successful if the patient has reported that there are no available vegetable options to eat at work. Instead the short-term goal should be developed to address this barrier to dietary behavior change and could be revised to, "I will eat two servings of vegetables during each work day which I prepare at home and take with me to work. These will include raw carrot or celery sticks that I keep at my desk, a salad I prepare, or if not a leftover vegetable dish from dinner that I will reheat in the break area microwave at lunch time." This level of specificity promotes behavior change in a way that is achievable within the individual's "influences" on dietary decision making. Goal setting is most effective when accompanied with self-monitoring.

### Self-Monitoring

Self-monitoring in the context of diet is the act of recording a specific dietary behavior on an ongoing basis. The value of self-monitoring lies in repeated awareness or cues for healthy decisions. However, the recorded information must align with the short- and long-term goals that have been set. For example, recording of all foods consumed may be relevant when energy intake goals have been set for weight loss, but may overburden patients and have less relevance when the target behavior is reduced sodium intake for blood pressure control. In this situation, having individuals record sodium content from labels of foods consumed and/or use of salt shaker/packets may have more relevance and thus be more acceptable and sustainable for self-monitoring behavior. Components of eating behavior that are frequently self-monitored for diet change include not only tracking of overall diet and specific nutrients (sodium, fiber, fat, fruit, and vegetables), but also meal spacing, location, timing, rate of eating, and stimulus control.

Self-monitoring can be challenging to initiate and matching the approach to the individual can facilitate success in this area. For example, a younger patient with a smartphone may wish to use applications (apps) to record intake and may find the immediate evaluation of outcome (sum of sodium intake throughout the day) motivating to continue self-monitoring and yet would have resisted writing down all foods consumed in a diary format. The frequency of self-monitoring also is important. General practice is to recommend that dietary monitoring be completed daily at least in the initial change period (6–12 weeks). After this point, self-monitoring frequency may be reduced without marked recidivism in behavior, but should not be eliminated as a behavior change strategy all together. Self-monitoring also should be increased in frequency and adjusted in context as new barriers to change are identified and new approaches to achieving long-term health goals are set. Self-monitoring has been consistently associated with weight loss, although there is a lack of evidence in diverse populations as well as objective measures of adherence to self-monitoring protocols or estimates of "dose" required to achieve weight loss (Burke, Wang, & Sevick, 2011). Of note, advances in electronic monitoring of eating and lifestyle behaviors suggest new electronic approaches, particularly when combined with daily feedback messages, may improve adherence to self-monitoring and thus indirectly result in greater achievement of dietary behavior change goals (Burke, Conroy et al., 2011; Burke et al., 2012).

### Group Support

Support is an important factor for behavior change as well as for increased duration of change over time. Support may be in the form of groups as has been commonly employed in several long-term dietary trials requiring substantial dietary change including the Women's Health Initiative Dietary Modification trial (Anderson et al.,

2003), the PREDIMED trial (Zazpe et al., 2008), and the Look Ahead trial (Ryan et al., 2003). Attendance at group sessions also has been associated with greater adherence to dietary goals (Tinker et al., 2007). There is also evidence that group counseling may be more effective than phone-based counseling of individuals for weight control (Befort, Donnelly, Sullivan, Ellerbeck, & Perri, 2010).

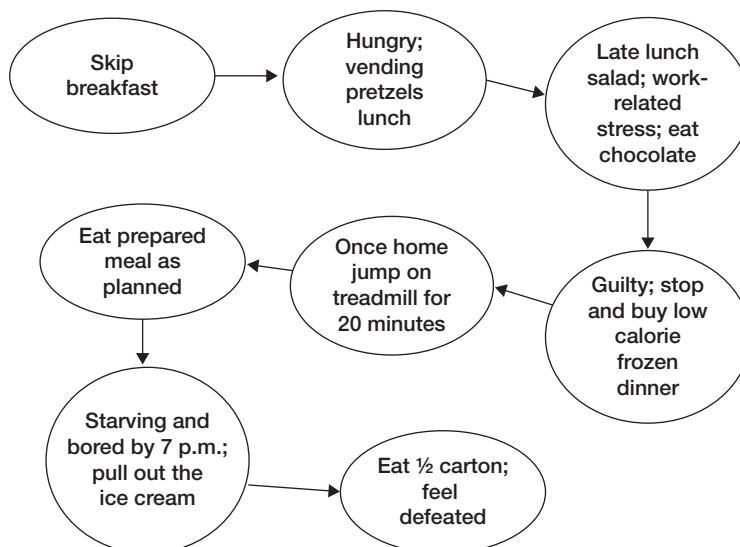
Beyond group support, perceived support from clinic or study staff throughout trial participation also has been shown to promote greater change in eating behaviors mostly related to enhanced self-efficacy and to promote eating behavior change. Frequency and quality of contact as well as extended duration of contact each may have independent effects on dietary behavior change and both appear to be integral to achievement and maintenance of dietary behavioral goals (Middleton, Patidar, & Perri, 2012; Turk et al., 2009).

Additionally, Perri and colleagues have evaluated social support for healthy behaviors and identified an important role for friends and family. This work suggests that family and friend support is associated with greater success with weight loss (Kiernan et al., 2012).

### Problem Solving

Behavioral approaches to dietary change generally address the issue of problem solving early in the counseling process. The important issue here is for the patient/client rather than the clinician to identify problems. This is important if there is to be ownership of the short-term goals required to address the problems as identified. Problem solving requires the use of both cognitive and behavioral techniques and not only addresses the person's perceived barriers to behavior change, but also their prior or planned approaches to overcome these barriers to promote the achievement of dietary goals. The discussion may begin with an open listing of barriers followed by a review of usual daily activities around food that may help to identify additional barriers. Developing a diagram of the behavior chain surrounding food choices can help the patient/client to identify barriers that are not as readily apparent without reviewing a typical day's activity and how these may inform eating choices. Figure 7.4 provides an example as to how a behavior chain might be developed in conversation with the patient/client.

**FIGURE 7.4 Food behavior decision making: Identifying barriers to change.**  
(Adapted from Foster et al., 2005)



Once barriers have been identified, a discussion will commence to identify not only approaches previously employed that were successful in promoting healthy eating, but also to define and describe with specificity new strategies that the patient/client identifies as adoptable for use in meeting dietary behavioral goals. The role of the counselor is to facilitate the identification of barriers as well as change strategies. Problem solving is not a stand-alone technique but rather is generally applied within a larger behavioral plan to promote dietary change.

### **Motivational Interviewing**

Motivational interviewing is perhaps the most commonly employed strategy to dietary behavior change. Several companies have been established in recent years to address the need for enhanced training of health care providers on this approach. It is incorrect to assume one can use motivational interviewing to effectively help patients/clients change eating behaviors without ample training on the topic. Motivational interviewing is a collaborative, person-centered form of guiding individuals to elicit and strengthen motivation for change (Miller & Moyers, 2007). Motivational interviewing helps individuals identify and resolve ambivalence with behaviors targeted for change and centers on motivational processes that facilitate the desired change. Motivational interviewing (2012) by nature is a conversation between the patient/client and the health care provider that honors autonomy and is evocative ([www.motivationalinterviewing.org](http://www.motivationalinterviewing.org)). An effective motivational interviewing interaction has been described to include eight tasks: openness of discussion, proficiency in client-centered counseling, identifying change and sustain talk, eliciting and strengthening change talk, reflectively hearing sustain and resistance talk, recognizing readiness toward development of a change plan, consolidating commitment, and transitioning and blending motivational interviewing techniques with other effective behavioral approaches and strategies (Miller & Moyers, 2007).

### **Technology and E-Strategies for Dietary Behavior Change**

The wealth of new innovations, apps, and devices for dietary assessment, self-monitoring, and behavior change has presented new challenges in dietary behavior change. The theoretical model that has the most relevance here is likely the Diffusion of Innovations Theory although several studies using these methods also report use of Social Cognitive Theory, Transtheoretical Model and Precaution Adoption Process (Norman et al., 2007). Whether current health behavior models will have validity in relation to the increasingly interactive and adaptive mHealth approaches remains to be determined (Riley et al., 2011).

Overall there is limited but growing evidence as to the degree of behavioral change that can be achieved using technological approaches. Less is known about how sustainable dietary behaviors are when they are achieved with the support of e-technology. Evidence does show that significant changes in dietary behavior, including those associated with weight loss can be achieved without face-to-face contact between participants and weight loss providers (Appel et al., 2011). The lack of comprehensive evidence should not be perceived as lack of efficacy. In reality, several studies have been completed to evaluate the degree of behavior change that can be realized, although the best methods for delivery, best devices to be employed, dose, and duration have yet to be defined. A review by Norman and colleagues in 2007 identified 7 diet interventions using mHealth and 11 weight loss interventions (Norman et al., 2007). Table 7.2

**TABLE 7.2 Select Studies Using e-Health Technology to Effectively Promote Dietary Behavior Change**

STUDY LEAD INVESTIGATOR	TECHNOLOGY OR PLATFORM	TARGET BEHAVIOR	TARGET POPULATION
Carpenter, Finley, & Barlow, 2004	Interactive website	Healthy Eating Index score	N = 98; middle-aged, predominantly Caucasian females
Stevens, Glasgow, Toobert, Karanja, & Smith, 2003	Website	Dietary fat intake	N = 616; age 40–70 y; overweight/obese females
Nollen et al., 2013	Handheld computer program	Fruit and vegetable intake	N = 15 ; age 8–15 y; females only
Oenema, Tan, & Brug, 2005	CD-ROM	Fruits, vegetables, and fat	N = 616; middle-aged males and females, worksite-based
Baranowski, Baranowski, & Cullen, 2003	Computer games	Fruit and vegetable intake	N = 1578; children aged 8–12 y
Anderson, Winett, Wojcik, Winett, & Bowden, 2001	Grocery store kiosk	Dietary fat, fiber, fruits, and vegetables	N = 277; greater than 97% Caucasian adult females
Newman et al., 2005	Interactive telephone	Dietary fat, fruits and vegetables, and fiber	N = 3088; female breast cancer survivors
Irvine, Ary, Grove, & Gilfillan-Morton, 2004	Interactive multimedia	Fruit and vegetable and fat intake	N = 517; middle-aged, predominantly Caucasian females at worksite
Spring et al., 2012	Telephone coaching plus mobile decision support technology	Fruit and vegetable intake, saturated fat and caloric intake; sedentary time	N = 204; adults with low scores on healthy lifestyle behaviors
Block et al., 2008	e-mail lifestyle intervention	Fruits and vegetables, saturated fat, added sugars, physical activity; self-efficacy, stage of change	N = 787; age 19–65 y; 95% female; majority Caucasian

lists select dietary intervention trials that employed a variety of e-health technological approaches to effectively promote diet and/or lifestyle behavior change.

As suggested in the table, earlier studies focused primarily on the use of telephone-based counseling and CD-ROM delivery of information. More recently, efforts are ongoing to expand to smartphone applications and game-based multi-modality interventions to promote behavior change; however, there is a paucity of research providing comparative effectiveness between the methodological approaches employed. There is also the challenge of a rapidly changing technological environment in relation to available apps, devices, and delivery systems, such that by the time a study is complete and reported in the literature, new more novel and perhaps more easily implemented devices and apps may be available. Further, across cultural, gender, education, and age groups adoption of individual devices and apps can vary widely not only in relation to apps commonly used but also to the frequency of use and time to full adoption. These factors challenge the external validity of the research being done to evaluate e-technology for behavioral change.

### **Promoting Healthy Eating Behavior: The Clinical Setting**

In addition to individual and group specific counseling efforts designed to support healthy eating choices, the clinical environment can serve as an additional reinforcement for patients and clients. First and foremost efforts by health care providers must receive adequate training on the importance of diet in health as well as effective methods to promote improvements in eating behaviors. Yet, deficiencies in current training programs continue to be identified (Vitolins et al., 2012). Providers also must develop competence in addressing eating behaviors with their patients/clients and avoid disparagement of those who report lower quality diets or who are obese, a common and generally socially acceptable prejudice in our health care system (Wolf, 2012; Teixeira, Pais-Ribeiro, & Maia, 2012). Empathy in encounters is central to meaningful interactions toward change in eating behaviors. Health care providers should ask patients their own perceptions about their weight or dietary behaviors and build from the response, affirm the difficulty in making and sustaining changes in eating behavior, and listen carefully using a patient-centered approach.

Beyond developing an empathetic initial encounter, the physical office can be modified to deliver an attitude of empathy, education, and self-empowerment. First, evaluate the clinic in relation to physical attributes (e.g., room to wait comfortably, chairs without arms, scales that are capable of weighing morbidly obese patients, examination gowns that fit all sizes, and use of large blood pressure cuffs). Second, provide access to relevant educational resources (healthy food choice/behavior pamphlets, websites, diet assessment/monitoring applications for e-health, posters on the clinic walls promoting healthy food, and even an office policy to restrict unhealthy food and beverages in the clinic setting). Third, provide clinic staff the opportunity, support, and recognition for advancing their skills in behavioral counseling to support patients who select to undertake change in eating behaviors. Consider having clinic staffs adopt dietary behavior change personally so as to gain empathy and experience with the process. Finally, understand and communicate the importance of realistic expectations.

Finally, routine integration of healthy lifestyle promotion into health services is needed if we are to succeed in improving the health of the population. Strategies should engage the health care providers, managers, researchers, and patient representatives using a socio-ecological model wherein the health care system is actively partnered, individual behavior change is supported, and educational limitations are overcome in an effort to achieve optimal dietary health (Grandes et al., 2008).

## CONCLUSIONS

Changing dietary behaviors is challenging. Numerous factors contribute to every food choice including what, how much, when, and why we choose to eat. Complicating the matter more is that eating is a required behavior. Thus the decision must be repeated several times a day throughout a person's life; abstinence, employed for behavior modification of tobacco, drugs, or alcohol use, is not generally plausible except perhaps in relation to individual food omissions in the diet.

Current evidence suggests that clear and specific goals that are patient/client-identified and defined, as well as self-monitoring of the behavioral goals established, are a necessary component of any successful change in eating behavior. These goals must be complemented with clear antecedents to provide clients with the "how to" for successful eating behavior change in the context of their individual life circumstances. Additionally, relapse prevention and recovery is an essential phase in any long-term plan for sustained eating behavior change.

Promoting healthy food choices and related eating behaviors for patients/clients is critical to reducing obesity, obesity-related chronic diseases, and a variety of other clinical diagnoses. Despite the challenges, when patients are able to change eating behaviors to healthier choices there is a clear benefit that translates to numerous disease-specific outcomes.

To summarize:

- Changing dietary behavior is complex and requires long-term, dynamic approaches and strategies.
- No one behavioral theory works best; theories should be adapted for the individual intervention and/or patient/client.
- Patient-centered counseling including motivational interviewing is perhaps the most tested and effective strategy for dietary behavior change to date, but many providers lack sufficient training to effectively apply, for example, motivational interviewing in practice.
- To promote change in dietary behavior, clinicians should help clients set clear and specific goals, promote self-monitoring, recognize the role of social support and use it to enhance change in eating behavior, review the mechanisms for behavior and behavior change (antecedents), and focus on preventing relapse.
- Efforts to identify and determine "best practice" regarding behavioral theories, constructs, and strategies to help patients/clients improve dietary behaviors need to be continued.

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